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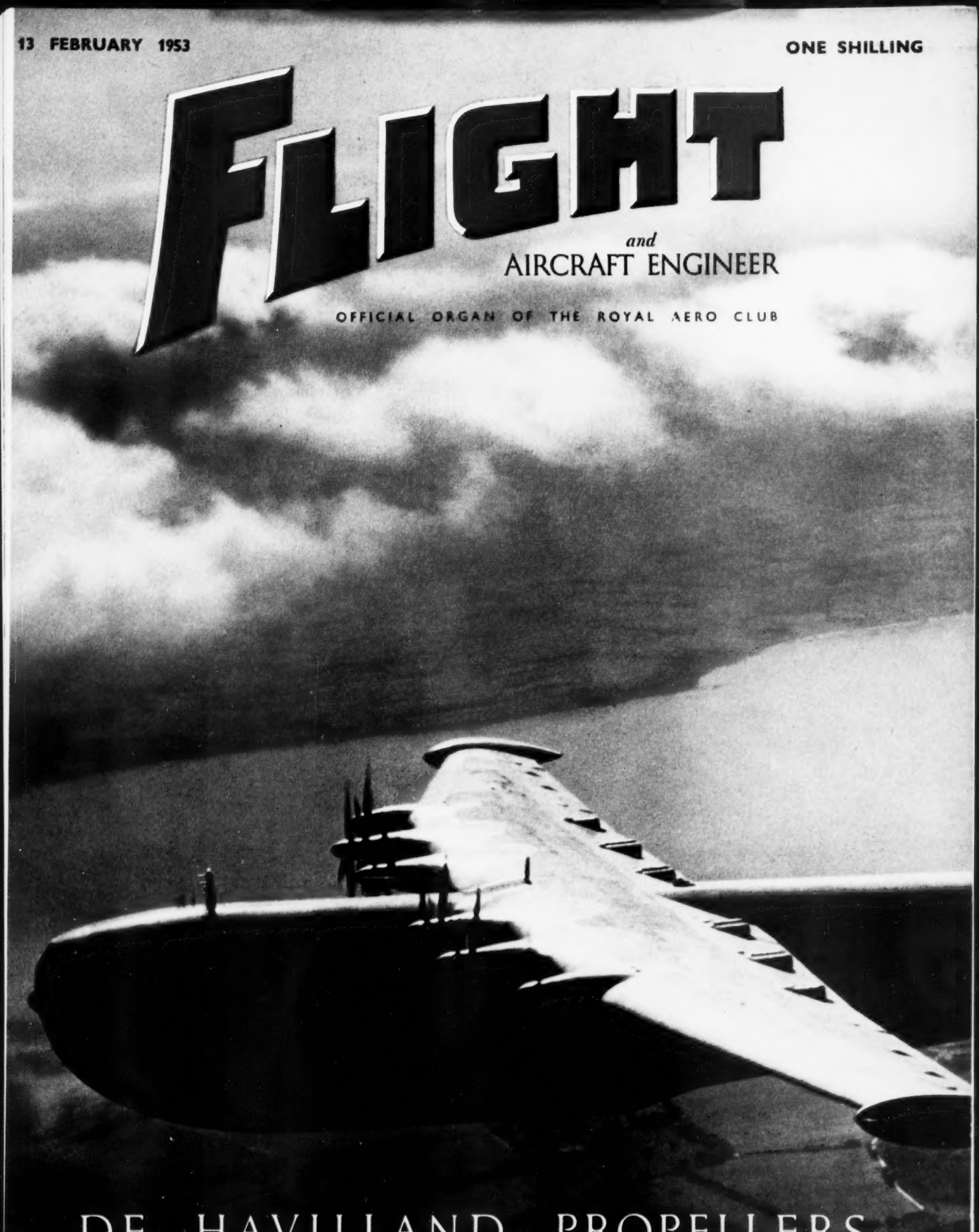

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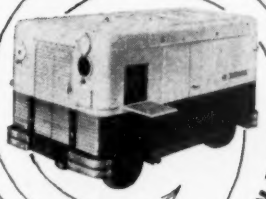

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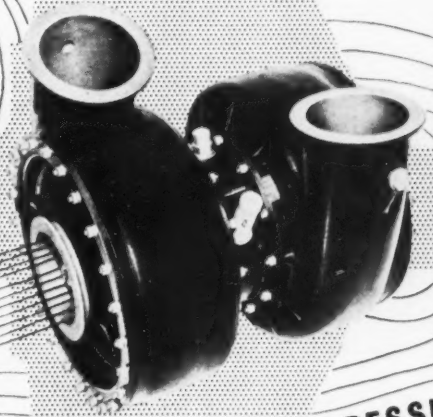

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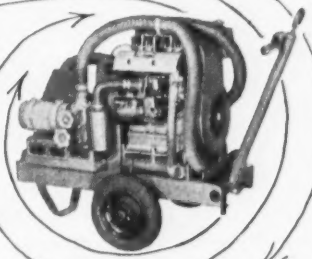

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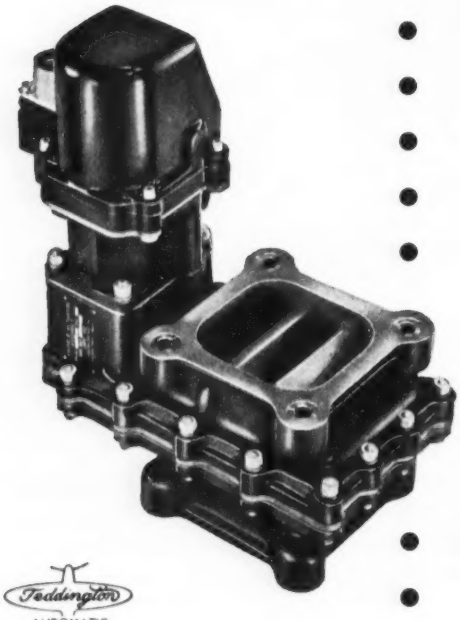

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UNITED AIRCRAFT EXPORT CORPORATION

U.S. STILL RETAINS ITS LEAD IN THE AIR, SAYS RENTSCHLER

Despite widespread reports to the contrary, the United States still maintains the military and transport air supremacy it has enjoyed since World War II, according to Frederick B. Rentschler, chairman of the United Aircraft Corporation and recognized authority on world aviation.

American developments of the past five years, particularly in jet-turbines, indicate "we are in no danger of relinquishing that supremacy," Mr.Rentschler told a recent press conference. "And," he added, "We have the powerplants on hand to prove it."

In respect to commercial jet-powered transports, Mr. Rentschler said there has been "endless propaganda" on jet transport advancement "that makes us look as though we are now in second spot." Some of these stories imply that American piston-engine planes soon will be swept off the world's airways. "It is our considered judgment," he said, "that efficient heavy jet transports, which will meet the requirements of American domestic and overseas routes, will not be available except as prototypes before 1956." After that, development of production models will take most of another five-year period ending in 1961.

Mr. Rentschler said studies indicate that the powerplant needed for the jet transport of the future is an engine of at least 10,000 pounds thrust, with a fuel economy "far superior" to any now in operational use. He added that Pratt & Whitney has an engine, designated the J-57, in that 10,000-pound thrust class.

SIKORSKY DUBBED "MR. HELICOPTER"

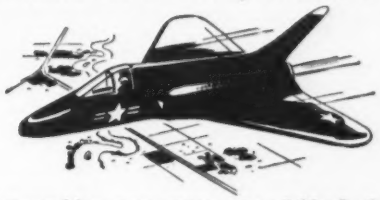
Igor I. Sikorsky, Engineering Manager of the United Aircraft Corporation's division which bears his name, recently received the National Defense Transportation Association's 1951 award as the person contributing most to the field of defense transportation during the past year.

The award, a giant silver bowl, was presented to Mr. Sikorsky by Thomas K. Finletter, Secretary of the Air Force. The Secretary dubbed him "Mr. Helicopter" and said, "He, himself, is a milestone in the history of aviation."

HAMILTON STANDARD UNITS TO COOL NAVY'S NEWEST FIGHTER

Hamilton Standard Division's air cycle refrigeration equipment has been selected for use in the U.S. Navy's bat-wing Douglas F4D. Individual units are required to cool the plane's cockpit and electronics compartment.

Substantial orders have been received for the 14.7 pound unit, which despite its small size and weight will change the cockpit air 260 times in an hour, and do a cooling job at a rate equal to that required to manufacture 2 tons of ice per day. When in maximum operation the unit bleeds air at 600 degrees Fahrenheit from the F4D's jet engine, passes it through a heat exchanger and a tiny turbine, and delivers it at 20 degrees --within a split second.



Hamilton Standard refrigeration or air conditioning units are now specified for eight U.S. Air Force and Navy aircraft.

TURBINE ENGINE STARTER TO BE PRODUCED AT WINDSOR LOCKS

A new liquid-fuel starter for turbine engines will be placed into production by Hamilton Standard Division this year. The starter utilizes a mono-propellant -- a fuel which burns and produces energy without air.

The Division will manufacture the starter under a recent licensee agreement with Plessey Company, Ltd., of Ilford, Essex, England. Already intensive refinement and development work has begun at the Division's new Windsor Locks plant to adapt the Plessey design to American requirements.

NEW CORSAIR FLYING IN KOREAN COMBAT

Pilots of the U.S. Marine Corps are now flying Chance Vought Aircraft's new AU-1 Corsair in combat in Korea. The new AU-1 is an attack version of the famed F4U Corsair of World War II. It is heavily armored and heavily armed, specifically designed to meet the close support problems encountered in Korea's hill-and-valley terrain.

At the beginning of the Korean conflict, earlier versions of the Corsair began blasting the way for United Nations' ground forces. When it became evident that a more powerful aircraft was needed to meet tough ground support problems, the Navy Bureau of Aeronautics decided to save time and money by converting the Corsair into an attack airplane. The result is the AU-1, able to force the fight under any circumstance.

FIFTH ANNIVERSARY MARKED BY LOS ANGELES AIRWAYS

Los Angeles Airways, Inc., the world's pioneer operator of helicopters in airmail flying, marked its fifth anniversary recently at ceremonies dedicating Los Angeles' first official heliport, atop the Post Office Terminal Annex Building.

During the first five years of operation the company's helicopters made 21,127 landings and handled more than 15,000,000 pounds of mail to and from the post office roof. This focal point, now a modernized and fully equipped heliport, is the key link in a four-route traffic pattern covering 356 air miles. Sikorsky S-55s and S-51s are used, and original S-51s are still flying regularly and dependably.

Virtually all of the mileage was flown by Sikorsky S-51s, first put in service Oct. 1, 1947. S-55s recently were added to mail routes.

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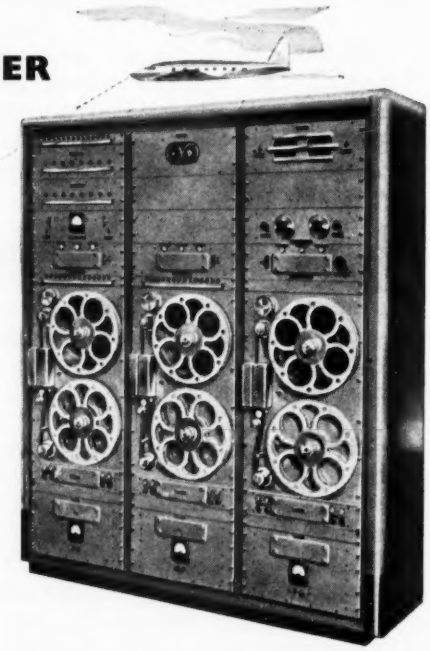

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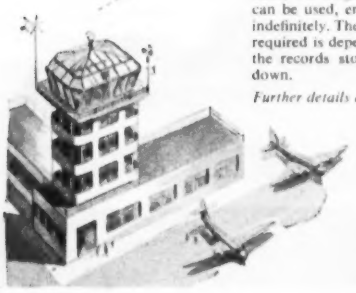

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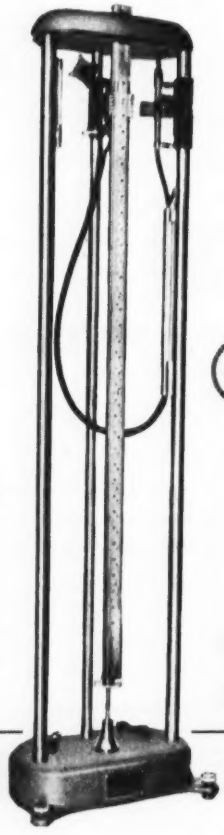

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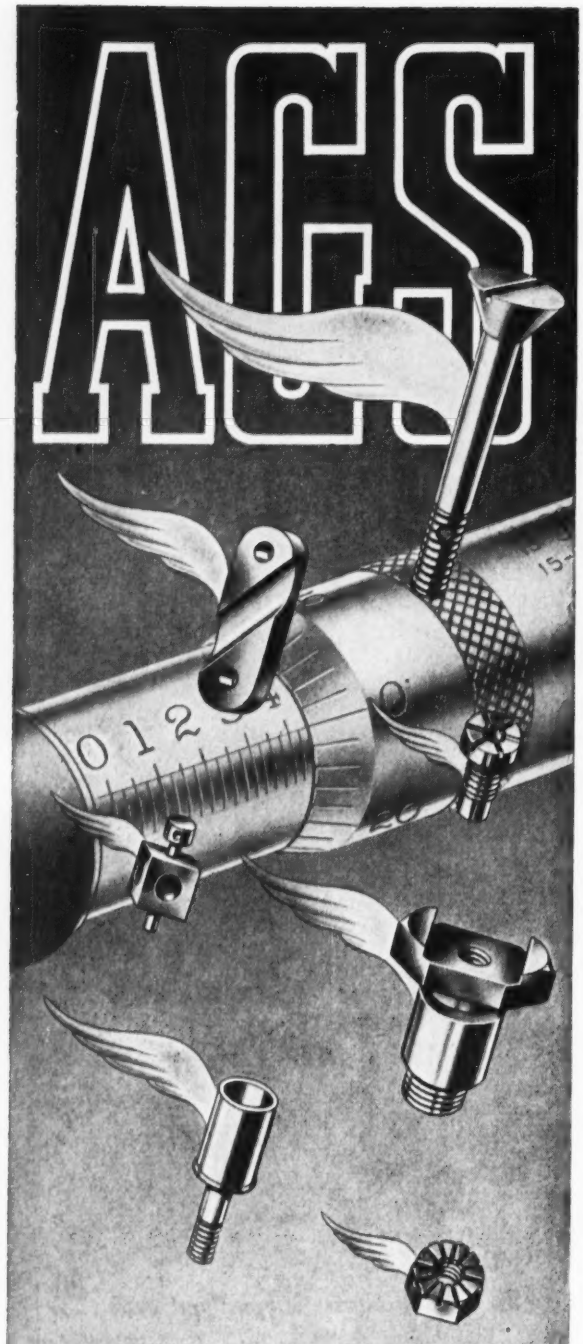

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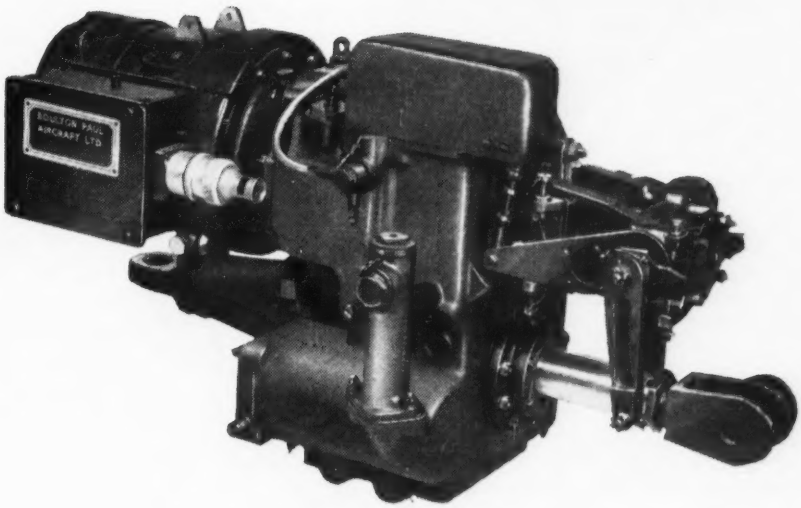

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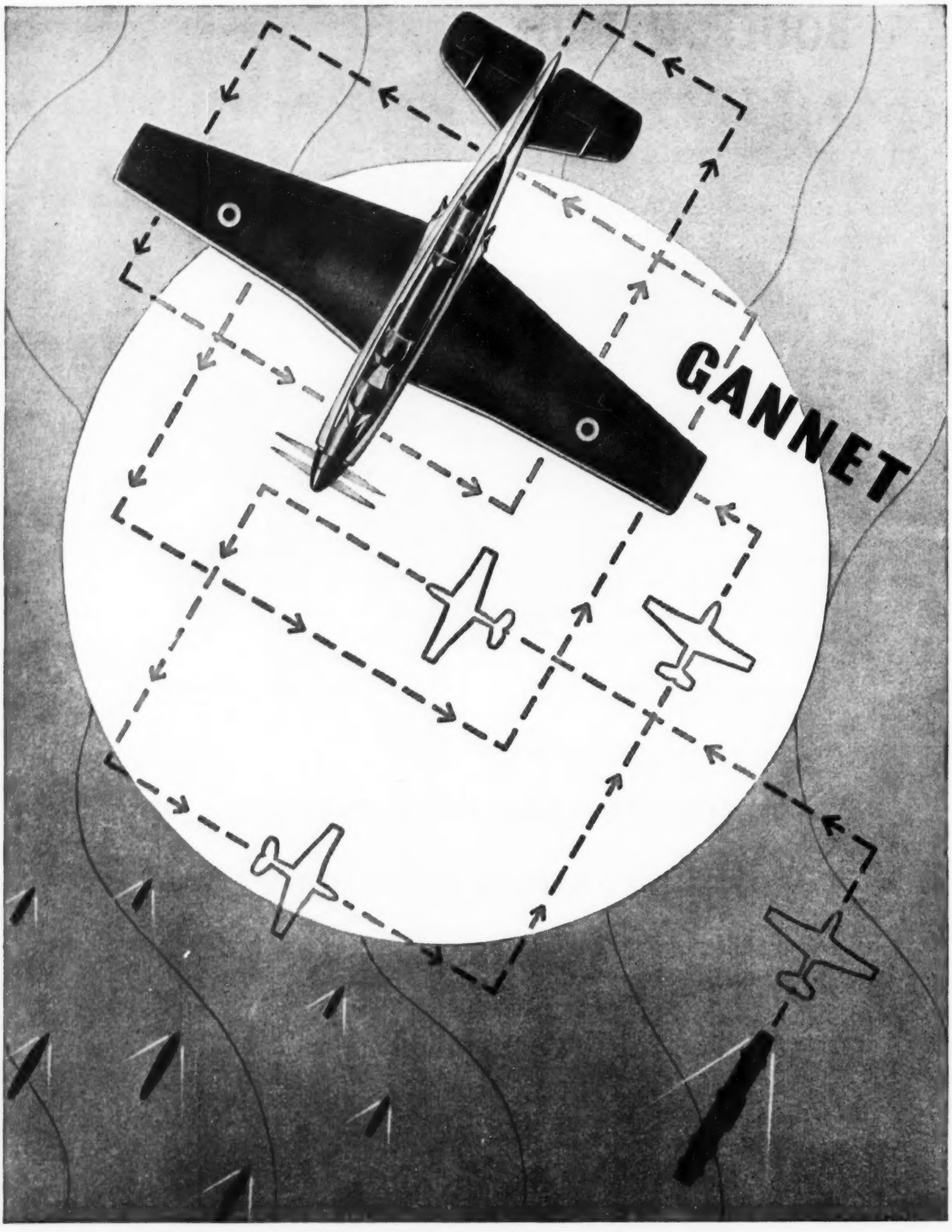

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Founded 1909

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Rapide Replacement

JUST as the DC-3 set a new standard in civil aircraft and subsequently became the most widely used transport in the world, so in its own smaller class has the Rapide built up a unique reputation in almost every country. When people come to talk normally in terms of a replacement for a specific aircraft rather than for a weight or capacity class, then that machine is assured of its place in aviation history. It is so with the DC-3 or Dakota—we discussed this aircraft and its successors a few weeks ago—and the faithful Rapide has earned a similar distinction.

A parallel position exists between these two classic types and the designs which have followed, as it were, in their respective slipstreams. In each case there have naturally been advances in speed and load-carrying capacity (and probably in other performance characteristics as well) and there is much greater refinement; the cost has increased enormously and the efficiency to a lesser extent. That much of the versatility and attraction of the DC-3 and Rapide has resulted from their ability to fly slowly, operate from small fields and, if need be, to remain serviceable in most climates with attention only from ground crews of limited skill, appears in the main to have been overlooked or its importance misjudged.

We appreciate that a replacement aircraft need not necessarily be of the same size as its predecessor; but in many parts of the world, while the regular handful of passengers for each local service may have increased to two handfuls the airstrip and its lack of facilities have remained unchanged.

When not talking of enormous speeds and heights, Sir Frederick Handley Page has recently emphasized the importance of slow approaches, low landing-speeds and short take-off and landing runs for transport aircraft. The opinion of the maker of the *Heracles* and *Hannibal* classes of aircraft should not be dismissed lightly. Since the majestic *Heracles* 38-seater biplanes plied between London and Paris, aircraft capable of two or three times their speed have taken over, but their reliability has not been bettered and the journey time, for one reason or another, has increased by fifteen minutes or more—such is progress.

A Large "Light" Aircraft

To return to our subject, however, we believe that there is a firm market for a simple light twin to take over the sort of work which has for so long been handled by D.H. Rapides. There are, of course, Doves, Princes and Herons, but excellent as these are from the point of view of the Colonial operator or the small charter firm, they are in a class different from that of the Rapide. They are the smallest members of the airliner fraternity, whereas the requirement is more for the largest member of the light-aircraft species.

We are not convinced that wood construction, total or partial, is a thing of the past for this class of aircraft; reasonable cost and easy maintenance and repair are among the major considerations. Several machines—including the Rapide, and more recently the Gemini—which did not have the advantage of the latest treatments for preservation, have shown that they can stand up to tropical conditions much better than had been expected. Two well-tried unsupercharged engines such as Gipsy Queen 30s should be able to provide sufficient performance, including single-engine safety, for a six- or seven-seater. Then there are Bombardiers for, say, five seats. Flaps and a well-designed retractable tricycle landing-gear should not bring with them unacceptible complication, weight or cost.

In the 1930s even private owners could afford to buy, help to service, and operate solo a Rapide; not so the larger and more elaborate aircraft believed by some to replace it today. Thus, for many important communications, taxi, local mail, feederline, ambulance and executive-transport duties at home or abroad the operators from small fields and airstrips must look to such American machines as the Twin Bonanza (and wish for a large balance of hard dollars), or the Italian Macchi 320 (and wonder if it is as good as it looks), or again, perhaps, to the 700 Series of Morane-Saulniers in France. Then they may look back at the British industry which produced the Rapide and can still design and build the best and cheapest aircraft in the world, and just wonder.

RESCUE at HOME and ABROAD

Aircraft and the Floods: Helicopters show their Value: Rotorcraft for Jungle Rescue

FOR thousands of people in the British Isles and Holland, the first week of this month was a tragic and anxious one; but almost always, in the event of disaster, friends known and unknown turn up from all sides. The floods were no exception: both here and in Holland the nation and individuals responded at once, and many other countries have added generous gifts in cash and kind to their messages of sympathy.

Floods which bring to a standstill almost all normal forms of transport also bring out the unique qualities of the helicopter for rescue work. For example, a small number of these machines, belonging to the Royal Navy and to the Ministry of Supply, had managed to rescue more than 600 Dutch people by last week-end and the good work was continuing. The flood-rescue and supply activities of aircraft of several kinds are referred to below.

Recently, following the arrival of a squadron of Royal Navy Sikorsky S-55s in Malaya, a new variant of the Bristol Sycamore was despatched by air transport for trials in jungle rescue work in that area. Here again the helicopter is able to serve where all other forms of transport are powerless. The Sycamore ambulance is described in a later section of this composite feature.

The third example of helicopter rescue-work comes from Sweden, where a private rescue organization has been in operation for some time past. Among its vehicles are Bell helicopters. A photograph on this page shows a simulated rescue from ice, too thin to carry a rescue party on foot but too thick to allow the quick passage of a boat. The small helicopter does not carry a winch, and in this case, it seems, a special aluminium boat is dropped from a low hovering altitude to the surface of the ice. The boat can then be propelled ashore at leisure.

THE FLOOD: ERRANDS OF MERCY

THE ever-increasing number of uses to which aircraft, notably helicopters, can be put in times of emergency has been vividly illustrated during the almost unprecedented floods in Holland and England. For example, nine Dragonfly helicopters of No. 705 Sqn., under the command of Lt. Cdr. Spedding, R.N., were in almost continuous daylight operation from Woensdrecht airfield in Holland from the time of their arrival on February 2nd until the situation became easier. Priority tasks were the delivery of two-way radio sets to isolated areas, and of drugs and doctors to combat any possibility of a typhoid epidemic. On the return journeys from these sorties, women, children and old people who were sick or infirm were carried to safety, and thereafter the pilots set about the task of rescuing anyone they could find—from roofs, window ledges, tree-tops and all manner of insecure perches. Most of these stranded people were winched up into the hovering aircraft. Several hundred were saved in this manner, and further work of the same type was carried out by helicopters sent by the M.o.S.

An airlift to Holland was also put into operation, utilizing Dakotas, Piper Cubs and Austers: food, water, medicine and clothing were flown in, and casualties evacuated. Naval immersion suits from Burtonwood, Lancs, were delivered by a Transport Command Valetta. Six Ansons from the Allied Tactical Air Force in Germany dropped supplies to isolated communities.

Taken over Canvey Island from an R.A.F. Lancaster engaged on photo-mapping the inundated areas, this scene was typical of the flooded districts of Eastern England. (Below, left) An S-51 helicopter approaches a surrounded farm in search of survivors; in such instances a rotorcraft can hover, look for signs of life and, if necessary, lower a man or pick up survivors. (Below, right) A contrasting use for a helicopter—in this case a Bell operated in Sweden: thin-ice rescues are made with the aid of a small aluminium boat which is dropped near the victim.

(Left) The detachable perspex blister of a Bristol Sycamore about to be fitted in position before evacuation of "casualties" attended by a medical orderly. (Right) Back to the floods : R.A.S.C. personnel preparing to drop bundles of sandbags from a Hastings. As no helmets are worn, presumably the parachutist warning-lights were used to indicate the desired moment of release.

Prince Bernhard flew back early from New York and himself piloted a Dakota over the flooded areas before taking over the chairmanship of the emergency committee. Though Belgium was less seriously affected than Holland, Prince Badouin returned in haste from the South of France and made an air tour of the affected areas of his own country.

In England, helicopters were also employed, three Dragonflies of No. 705 Sqn. delivering 400 blankets to a parade-ground at Sheerness for the benefit of the people of Sheppey : two of them returned later, with other stores supplied by the Red Cross.

On Monday, February 2nd, one of these aircraft made an extensive aerial survey of Canvey Island and Sheppey to discover the extent of the damage of the flood. The following day, whilst one helicopter transported an official of the Ministry of Agriculture to flooded areas in the vicinity of the Wash, two others were engaged in supplying food to R.A.F. men on the Isle of Sheppey cut off from the mainland since the early hours of the Sunday morning. Much help was given throughout the danger areas by ground personnel from a number of R.A.F. stations. "Operation Canute," in particular, involved about 1,500 officers and men in an attempt to rebuild the sea defences on the Essex coast.

The lengthened undercarriage of the Sycamore Mk 10 is well illustrated in this photograph. Another feature is a side exhaust to reduce the risk of starting fires in dry undergrowth.

A major air effort made by the R.A.F. was "Operation Floodlight" (further details, page 209), the task of photographing the entire 250 miles of coast between Margate and the Humber from a height of 2,500ft. The operation was planned and laid on at, literally, a few hours' notice. Lancasters of No. 82 Squadron and two Mosquito squadrons were concerned. Three thousand pictures were taken on the Monday and Tuesday alone, and staffs at R.A.F. Stations Benson and Wyton worked 24 hours a day to maintain the pressure—but a London newspaper's statement that "The R.A.F. flew in sandbags" should not be taken too literally.

Further items of flood news from Holland, which became available last week-end, are given overleaf.

FOR JUNGLE RESCUE

FOLLOWING a brief mention in our special Helicopter Number we are now able to give more details of the Malaya-bound Bristol Sycamore Mk 10 for tropical trials and jungle rescue service.

Stowed in the hold of a Bristol Freighter, it left for Rangoon on January 20th *via* the middle East and India. With the machine went Mr. A. G. L. Langfield, representing the Bristol Company, and Capt. R. Smith, a helicopter test-pilot from the A. and A.E.E., Boscombe Down, who will carry out the tropical trials. These tests are expected to extend over the first two or three weeks, and the machine will then be handed over to the pilots of the R.A.F. Far East Casualty Evacuation Flight for a further ten weeks' jungle rescue service.

Essentially similar in its basic details to the standard Mk 3 Sycamore, the Mk 10 incorporates two Perspex blisters which—without imposing any aerodynamic penalty—increase the width of the cabin behind the pilot to allow two stretcher casualties to be carried athwartships. The new Bristol-designed lightweight stretchers are of tubular construction and, when not in use, can be compactly folded and stowed in the luggage compartment behind the engine bay. The lower stretcher mounting then provides the alternative of three passenger seats which, with the medical orderly's seat swivelled round to face forward, completes the standard five-seat arrangement.

The use of a new-type lightweight stretcher is a significant innovation. This departure from the standard army wooden stretcher may well have far-reaching and beneficial consequences both to the medical orderlies who use them on the ground and to the aircraft designers who have to sacrifice valuable payload to carry them in the air.

Other features incorporated in the Mk 10 Sycamore are the c.g. compensating device operated from the pilot's seat by an electric pump, the newly designed longer undercarriage to give additional ground clearance for landing in rough country, and the provision of a rope ladder to enable the observer to descend and guide the pilot to a suitable touch-down point.

An interesting feature of the early flight trials of this variant which began in 1951 was a series of flights without either the Perspex blisters or the alternative side covering panels fitted. The aerodynamic properties of the machine were not affected in any way. A certain amount of draught was experienced in the cabin, which might possibly have inconvenienced a wounded stretcher case, but was in fact rather pleasant for the pilot and observer in the front seats.

Rescue at Home and Abroad...

MORE NEWS FROM HOLLAND

FURTHER details of the extensive part played by aircraft in the Netherlands floods have been received from a Dutch correspondent since the previous page was printed. A large number of aircraft was based on Valkenburg, the naval air base near Leiden, and from there innumerable sorties were flown over the disaster area. Food, water, sandbags, dinghies, baby-food and other equipment and supplies were dropped from a large variety of aircraft from many countries, among which were nine U.S.A.F. C-119s from Germany; four Lockheed Harpoons, four Mitchells, three Sea Otters, and one S-51, all of the Netherlands Naval Air Service, and four Dakotas and two Expediters of the Air Force; four Expediters of the Dutch Government aviation school; four K.L.M. Dakotas; four R.A.F. Valettas; two Grumman Albatross amphibians and two Dakotas of the U.S.A.F.; two U.S. Army Beavers; two Danish Catalinas; a Danish B-17; a Norwegian Dakota; three Italian aircraft, including a Fiat G.212; the prototype Fokker S.13; and Prince Bernhard's Siebel 204.

From more advanced airfields, many light aircraft were in operation, notably from Woensdrecht and Gilze-Rijen. Fifty-five Harvards, 15 Beechcraft, an Anson and 21 other machines are mentioned. Meteors of the Allied Tactical Air Force from Eindhoven carried out aerial photography over the area.

The total number of helicopters in operation seems to have been at least 25: A Sycamore, S-51s, S-55s, Bell 47s and a Hiller 360. B.E.A. sent over two S-51s, piloted by Capt. Cameron and 1st/Off. Crewdson, and these two officers succeeded in rescuing no fewer than 76 people during five days of operations.

An American Bell 47 and a B.E.A. S-51 (G-AJOV) operating from a road on the Dutch island of Over-Flakkee.

Help in kind has also been forthcoming from America. Pan American World Airways set in motion "Operation Stop-gap," in which quantities of relief materials were flown across the Atlantic at the earliest possible moment. Loads have already been sent to Amsterdam, Paris and London, and space has been made available wherever possible on all trans-Atlantic flights.

In a letter of thanks for a message of sympathy despatched by a member of *Flight's* staff, a K.L.M. executive comments: "This is really a catastrophe, which would have been bigger if the airplane had not been on the spot."

FROM ALL QUARTERS

The New Zealand Race

ALL entries for the London-Christchurch Air Race, which is to start on October 8th next, are now in the hands of the Royal Aero Club. No official list of entrants is expected to be announced until February 18th, but it is understood that 25 applications have been received, and that these are in process of being checked by the Club.

As reported in *Flight* last week, the race will start from London Airport. Organized by the Canterbury International Air Race Council (Christchurch, New Zealand) and the Royal Aero Club, the contest will be flown in two concurrent sections, (*a*) speed and (*b*) transport handicap. The first prize in the speed section is £10,000 and the Harewood Gold Cup; in the transport section it is £10,000. Other cash prizes total £9,000.

The Developed Viscounts

AS we go to press, Vickers-Armstrongs, Ltd., announce that British European Airways have just signed a contract for the purchase of 12 "stretched" Viscounts, with the designation Viscount 800. This new aircraft, of which a general-arrangement drawing and seating plan appear below, has been made possible only by the continued development of the Rolls-Royce Dart turboprop, the R.Da.5 version of which gives 1,690 e.h.p.

In the Viscount 800, this extra power has been utilized by increasing the fuselage length by 160in, the normal seating plan providing for up to 82 passengers. The all-up weight will be 65,000 lb.

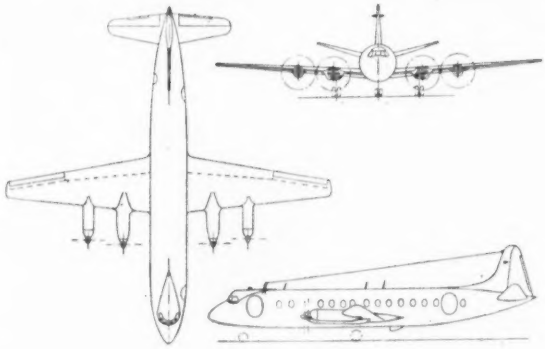
The B.E.A. order for 800-series aircraft is worth, with spares, some £3m and it brings to more than 80 the number of Viscounts sold. Vickers-Armstrongs emphasize that the new airliners are in no way replacements for the series 700 aircraft; rather do they permit the company to offer a complete range of efficient airliners for all types of short- and medium-range route patterns, each version of the Viscount being tailored to fit the needs of a particular type of operator.

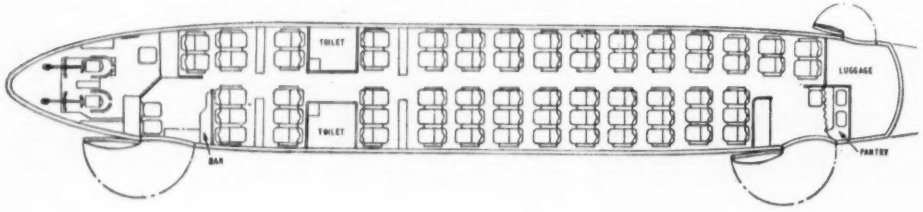
All 12 B.E.A. "800s" are due for delivery by October, 1955. The Corporation has a further eight on option, so deliveries of the type to other operators should be possible at the end of that year.

Off-shore Javelins?

ACCORDING to the *Financial Times*, which has proved unusually well-informed on such matters in the past, American pilots are to carry out evaluation trials on the prototype Javelin within the next few weeks—just as soon, in fact, as Glosters can make the aircraft available for this purpose. It is stated that the United States views with concern the absence of an all-weather fighter from the projected equipment of NATO Air Forces, and that—if the trials prove successful—an off-shore contract for the Javelin will be placed with the Fiat Company in Italy. Dollar payment for such an order would be unlikely to stem from the current fiscal year's $69m allocation, which is almost certain to be devoted to Hunter production.

It is also learned that a Bill has been placed before Congress to extend the restrictive deadline of July, 1955, for the completion of all deliveries of off-shore products. If this Bill were to be passed rapidly—which is by no means certain—there would be a considerable easing of the difficulties so far encountered in the placing of aircraft orders.





The general-arrangement drawing above shows the principal features of the Viscount 800 series. On the left is the seating plan of the Viscount 801, with 66 seats. Up to 82 seats are practicable.

Export v. Import

AIRCRAFT exports from the United Kingdom for 1952 totalled £43,933,539 in value, as against £41,955,652 for the previous year—an increase of £1,977,887. Imports for the period, however, also showed an increase, namely £2,460,081; the respective 1952 and 1951 figures were £12,901,261 and £10,441,180. The 1952 totals represent an import-to-export proportion of 29½ per cent.

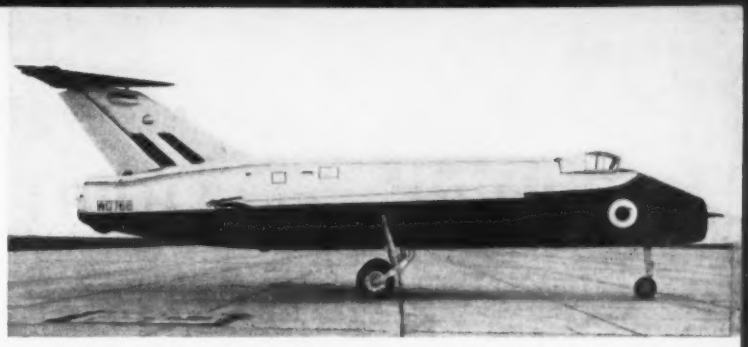
During the month of December, total exports were £4,504,604, of which £40,244 was for tyres. Imports for the month were £937,385, representing 22½ per cent of the export figure.

Pilotless B-36

AFTER being abandoned by its crew of 15, a U.S.A.F. B-36 flew itself some 30 miles over Wiltshire last Saturday before crashing and burning in a wood at Lacock, near Chippenham. The crew-members all baled out safely, with the exception of one officer, who broke an ankle.

The aircraft was one of a formation of no fewer than 17 which were on a flight from Carswell A.F.B., Forth Worth, Texas, to Fairford, Glos.

That the B-36—the type has a span of 230ft and, at over 150 tons a.u.w., is the heaviest in service anywhere—did not finish its pilotless flight in a town was a merciful providence. Like most air forces, the U.S.A.F. lays it down that a pilot shall abandon a distressed aircraft "at his discretion," and in the absence of any official details as to what actually happened (some reports say that the B-36 began to disintegrate in the air) it would be invidious to comment on the incident. The question does, however, arise as to whether new instructions for pilots are required, especially in view of the increasing number of very large aircraft in service, and of their potentialities of accidental mass-destruction in an emergency near a populous area.



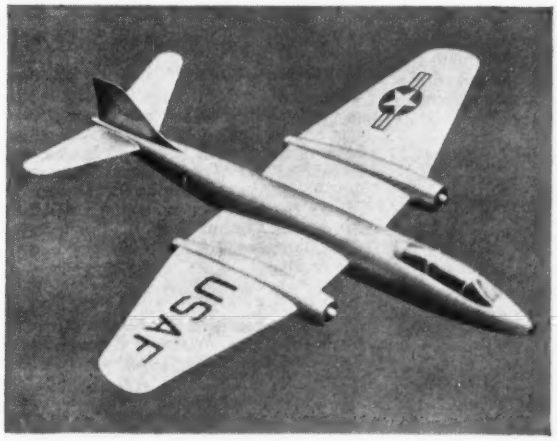
LENGTHY SHORT: This side view emphasizes the considerable size of the Short S.B./5 variable-sweep, slow-speed research aircraft. Powered by a Rolls-Royce Derwent, the machine abounds in unorthodox features.

Vickers-Armstrongs Aircraft Appointments

THE name of Mr. George Edwards, designer of the Valiant, Viscount and other famous Vickers-Armstrongs aircraft, figures prominently in a list of new executive appointments.

The list begins with the announcement that, during Maj. Hew Kilner's absence through illness, the duties of managing director of the aircraft division are being undertaken by Maj. Gen. C. A. L. Dunphie, C.B., C.B.E., D.S.O., in addition to his work as managing director of the engineering and shipbuilding division. It is also stated that Mr. R. P. H. Yapp, a director, is appointed assistant to the managing directors.

Mr. G. R. Edwards, C.B.E., B.Sc., F.R.Ae.S., A.M.I.Struct.E., formerly chief designer at the Weybridge works, is appointed a director of Vickers-Armstrongs, Ltd., and chief engineer of the aircraft division. (It should here be made clear that the Vickers-Armstrongs aircraft side is subdivided into two sections, familiarly known as the Weybridge and Supermarine divisions. Mr. Edwards becomes general manager of both.



MARTIN MODEL: The Glenn L. Martin company have spent so long "Americanizing" the familiar Canberra that it is no surprise to find that their B-57 version is of rather different appearance. This model shows the new nose, which houses radar, fixed guns and rockets, and crew of two in tandem; the engines are American-built Sapphires.

Left to right: Mr. G. R. Edwards, Mr. B. Stephenson, Mr. H. H. Gardner.

Chief designer (aircraft) at Weybridge is now Mr. B. Stephenson, A.F.R.Ae.S., formerly assistant designer; and another assistant designer, Mr. H. H. Gardner, B.Sc., F.R.Ae.S., is appointed to the new post of chief designer (guided weapons).

Mr. T. Gammon, O.B.E., M.I.Mech.E., who was appointed a director of Vickers-Armstrongs, Ltd., last July, becomes deputy general manager of the aircraft division; he was formerly manager at Weybridge. Lastly, Mr. R. Edmonds, M.B.E., previously works manager at Weybridge, becomes superintendent there.

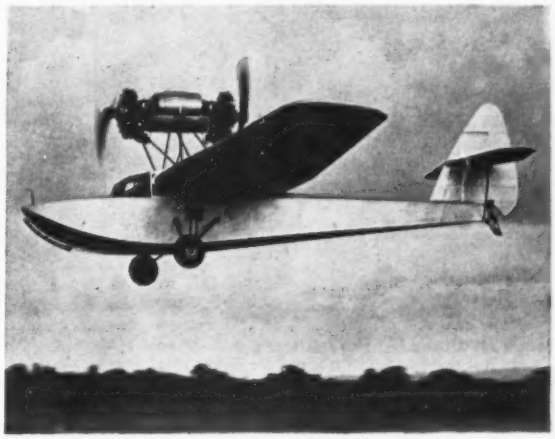
Hidden Treasure

THE photograph of a tractor-pusher light aircraft reproduced on this page may puzzle recognition enthusiasts too young to remember the Ibis (two 40 h.p. Salmson A.D.9s) which Bert Hinkler built in 1931 with the help of R. H. Bound (now Dowty technical director) and Basil B. Henderson, who was at that time manufacturing the Hendy series of light aircraft at Shoreham in partnership with H. A. Miles.

The Ibis has just come to light near Southampton, where (reported the *Southern Daily Echo*) it had been unearthed from a barn and was due to be broken up when Mr. Henry Stisted, managing director of the Hampshire Aeroplane Club, stepped in and saved it.

But the climax of the story was yet to come: on closer inspection of his purchase Mr. Stisted made an extraordinary discovery in one of its wings—nothing more nor less than the log-book of Hinkler's pioneer 16-day solo flight to Australia, made in 1928 in an Avro Avian.

Bert Hinkler was killed in 1933, when a Puss Moth in which he was flying to Australia was lost in the Alps.



DISCOVERED: The Hinkler Ibis (see "Hidden Treasure," above). "Flight" photograph

HERE AND THERE

Viscount Flagship Named

ON Wednesday last, Lady Douglas of Kirtleside was due to visit Vickers' Wisley Airfield to perform the naming ceremony of *Discovery* (G-ALWE), the flagship of B.E.A.'s Discovery fleet. Incidentally, the first Air France Viscount is now complete in its operators' colours.

Eastchurch Memorial

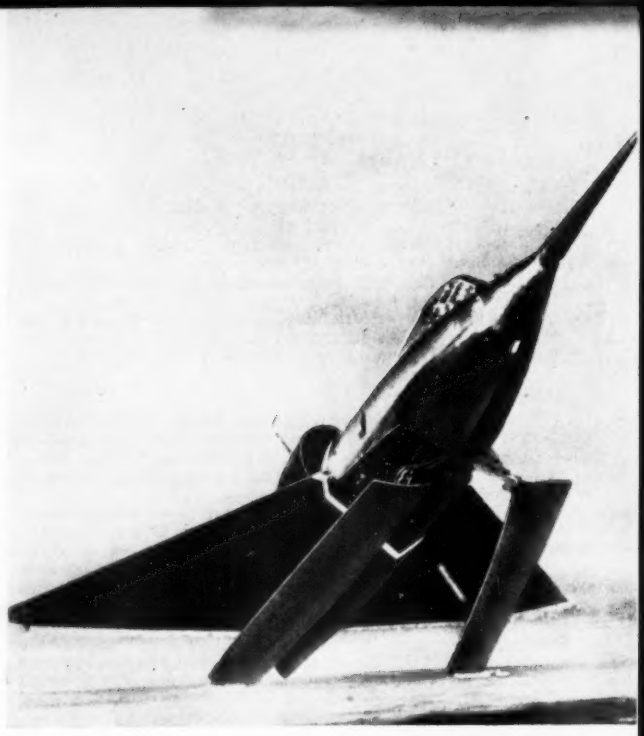
PLANS are progressing for the Eastchurch memorial to the pioneer airmen who flew at that airfield in the very early days, and Mr. Sidney Loweth, architect to the Kent County Council, has been appointed honorary architect to the memorial committee.

R.Ae.C. Film Show

THE next film show to be given by the Royal Aero Club (members and guests only) at Londonderry House will be on Thursday, February 26th, at 6.15 p.m., when *Theirs is the Glory* will be shown. This film is the story of Arnhem, and forms a tribute to the men of the 1st Airborne Division, who fought the battle of September 17th, 1944.

High Spy

THE McDonnell F2H Banshee—a twin-jet carrier fighter of the U.S. Navy—is well-known for its altitude performance. Banshees from the Naval Air Test Center at Patuxent River, Maryland, have photographed Washington, D.C., from a number of altitudes up to 51,000ft. The current copy of the American *Naval Aviation News* features an excellent vertical shot of the San Diego (California) area, obtained by an F2H-2P P.R. Banshee flying at 54,650ft. The particular negative was secured with a K-17 camera with 6-inch lens; the ground area included measures some 170 square miles.



DELTA DART: Like some giant ray leaping from the depths, the Convair XF2Y-1 Sea Dart is here seen mysteriously parked on dry land. It is seen to have surprisingly large hydro-skis ("Flight," December 5th, 1952) with slightly convex planing surfaces. Together, when retracted, they form the sides of the vee hull bottom. The "whip aerial" above the air intake is in fact the leading-edge of the fin.

Bristol on Wearside

THE Bristol Aeroplane Company already has two factories in the Pallion, Sunderland area, at which 750 men are employed on making engine components. It is now reported that the company is establishing a third plant in the district. It will employ about 250, and may be in production by the end of the year.

Training at the "Axed" Schools

IN the Commons last week, Mr. George Ward, Under Secretary of State for Air, said in a written reply to Mr. Frank Beswick (Lab., Uxbridge) that, in 1952, 625 National Service pilots and 156 navigators successfully completed their basic training at civilian training schools which were now to be closed. In a further reply he said that 107 N.S. pilots completed their training to wings standard at the schools in 1950, and 211 in 1951. Training of N.S. navigators did not begin until the end of 1950, but 43 completed their training to wings standard in 1951.

First-hand History

THE story of the Korean campaign, with special emphasis on the role of air power, was related during January at various air bases of the NATO Powers in France and Germany by Mr. William Courtenay, O.B.E., M.M., at the invitation of General Lauris Norstad, the commander of Allied Air Forces Central Europe. The lectures were illustrated by Mr. Courtenay's own colour films.

Airline Celerity

TWO unofficial records have recently been established by Convairs of Trans-Australian Airlines. The *Matthew Flinders*, piloted by Capt. R. Gray, broke the Hobart-Sydney record by four and a half minutes in covering the 625 miles in 123½ mins (304.5 m.p.h.), and the *George Bass*, under the command of Capt. R. Keig, cut three and a half minutes off the time for the Launceston-Melbourne run when it flew the 291 miles in 64½ mins (270 m.p.h.).

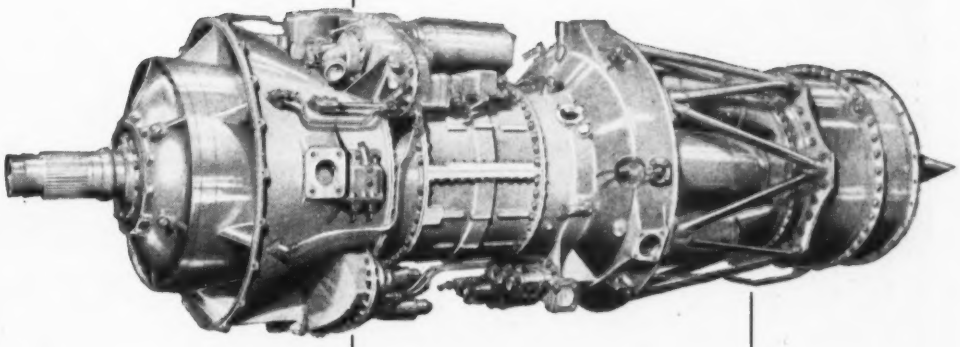
Italian Recovery

A ROME correspondent writes that the post-war difficulties of the Italian aircraft industry, show continued signs of decreasing. Last year between 6,000 and 8,000 workers were employed, and modernization of several plants was completed. Production to the value of 13,000 million lire (about £7½ m) was achieved. It is said that the present labour-force could, if necessary, be trebled at short notice. As recorded in an article in *Flight* on August 22nd, 1952, a major reorganization of the Italian aircraft industry is now in hand, based on long-range production programmes agreed upon by the Government, the Air Force and the companies.

Jungle Paratroop Action

RECENTLY 30 men of the 22nd Special Air Service Regiment, wearing special protective clothing, parachuted into the jungle in Central Johore, Malaya, in an attack on the headquarters of the "3rd Regiment of the Malayan Races Libera-

SEEING THROUGH IT: This interesting pictorial echo of the R.A.F. Canberras' South American tour has just come to light. It shows the Governor of Trinidad, with A.V-M. Boyle (leader of the mission) and others inspecting a novel plastic fuel-drum. Developed by Shell, the transparent drum is placed on a white surface in strong sunlight, so that the presence of any foreign matter in the kerosine sample—which itself acts as a magnifying lens—can be detected without difficulty.



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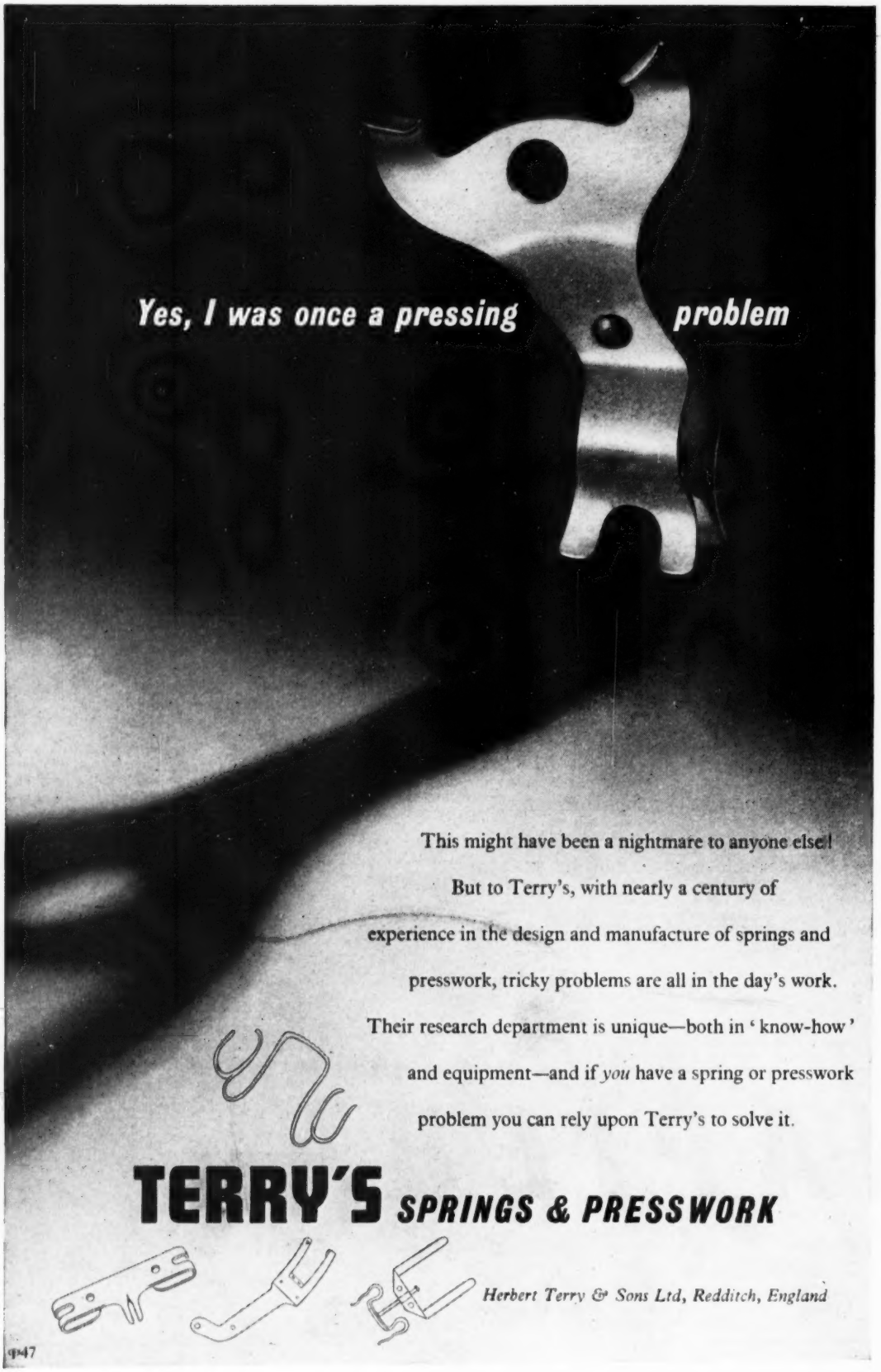
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HERE AND THERE . . .

tion Army." The operation began with an attack by medium bombers and cannon attacks by Hornets. The paratroops carried ropes to let themselves down from the tree-tops, but on arrival at the enemy camp it was found to be deserted. This is the third time that paratroops have been used in Malaya.

High-speed Swede

THE chief test pilot at the Swedish Air Force research station at Malmö, Captain Björn Frykland, is coming to England shortly in order to take a course in high-speed flying.

Arctic Defence

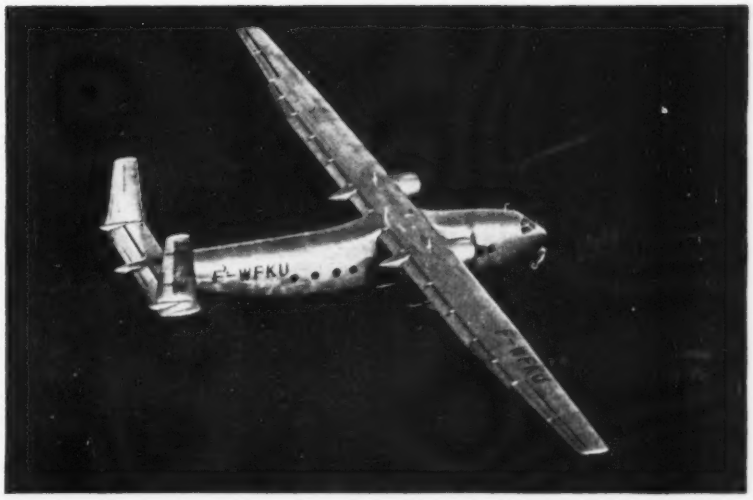
THE important port of Narvik already boasts two military airfields, at Bodo to the south and Bardufoss to the north. Hr. Haakon Eeg Henriksen, president of the Norwegian Engineers' Association, said recently that he hoped the third field, at Andöya to the north-west, would be ready for use in 1954. A runway of 3,300 yd was already under construction, he added.

Reward for Invention

THE third report of the Royal Commission on Awards to Inventors, recently published, shows that since February, 1947, the Commission has sat in public on 278 days and disposed of 325 cases, some of them of great complexity. Some 255 other claims were withdrawn after being submitted in advance in writing. Total awards to date have been approximately £616,770, and—although work remains to be done—the major part of the task allotted to the Commission has now been accomplished.

Russian Air Strength in Germany

ACCORDING to the usually reliable journal *Flugwelt*, Soviet air strength in the Eastern Zone of Germany is now much the same as it was six months ago: approximately 780 jet fighters, 250 fighter/bombers, 150 jet bombers, and 30 reconnaissance and 50 transport aircraft—a total of 1,260 in all. A Russian Air Force of similar composition is said to be stationed in former German territories east of the Oder and Neisse rivers. It is also stated that Soviet air bases are being constructed around Kottbus, 60 miles south-east of Berlin, whilst existing bases nearer the capital are being denuded of aircraft.



NO DELTA INFLUENCE: The Hurel Dubois HD.31 French transport has an aspect ratio of 20.2. It is seen here during its first flight, which was successfully completed at Villacoublay on January 27th—in conditions of poor visibility and low ceiling. We published a ground view of the HD.31 on the "Aircraft Intelligence" page last week.

Air Britain A.G.M.

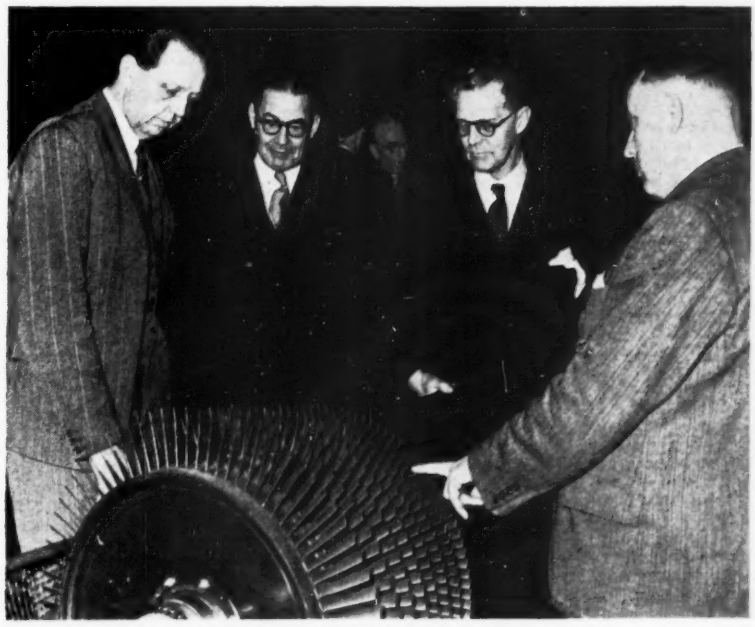
THE annual general meeting of Air Britain —"the international association of aviation enthusiasts"—is to be held at Londonderry House at 2 p.m. on March 21st.

Bigger and Better Drops

FOUR hundred tons of heavy construction equipment were recently parachuted from forty C-119s in the world's first mass drop of these weighty vehicles. The object of the exercise was to prove that such a drop would enable engineers to build an advance airstrip capable of taking transports up to C-124 size. Each piece of equipment was packed on top of a special "paradrop pallet," the whole unit being ejected over rollers in the floor of the aircraft at the critical moment. Up to six 100ft parachutes were used for each of the larger loads, which included two tractors of 21,000 and one of 18,000 lb, a grader of 18,000 lb, a dump truck of 17,500 lb, and a 1,300 lb scraper. Work on the airstrip started immediately: by evening 85 per cent of the vehicles were in operation, and by the following morning only one remained unserviceable. How soon the strip was in operation has not been revealed.

From 504 to Vulcan

AT the request of many collectors, *Flight* has for a long time maintained a postcard series of photographs depicting aircraft of the R.F.C., R.N.A.S., R.A.F., Fleet Air Arm and Naval Aviation. All these are still available; and to the series, which now totals 207, the following modern types have now been added: Hunter, Javelin, Swift, Venom F.B.1, Vulcan, Valiant, Gannet, Firefly A.S.7, Varsity T.1, Chipmunk T.10, and Sturgeon T.T.2. Prices are 8d. each card or 7½d. each for quantities of more than one dozen. Complete lists of the series are available. Only *one* view—usually a good three-quarter front or side—is included of each aircraft type. Other views can usually be supplied, but only at the standard prices for *Flight* photographs. These prices are (dimensions given in inches): 5½ × 3½, 1s 4d (glossy or semi-matt, unmounted) or 2s (toned sepia, unmounted); 6 × 4, 2s 6d or 4s; 8 × 6, 3s 6d or 5s 6d; 10 × 8, 5s or 7s 10d; 12 × 10, 6s or 9s 8d; 15 × 12, 9s 6d or 13s; 20 × 16, 13s or 18s.



SENIOR CIVIL SERVANTS AT FILTON: Sir Arnold Overton (Permanent Secretary, Ministry of Civil Aviation) and Sir George Cribbett (Deputy Secretary) recently visited the Bristol Aeroplane Company's works, making brief tours of the aircraft and engine divisions. Left to right, discussing a Proteus compressor, are seen Dr. S. G. Hooker (Bristol engine division chief engineer), Sir George Cribbett, Sir Arnold Overton and Mr. A. E. Eustace (sales department, engine division). In the background can be seen Sir Alec Coryton (divisional managing director, engine division).

Discussing Helicopter Maintenance

UNDER the auspices of the Helicopter Association of Great Britain, a discussion on "Standards of Maintenance and Requirements for Helicopter Engineers' Licences" was held in London on Saturday, February 7th. We here present, in shortened form, three of the four main papers; two by members of the Air Registration Board, and one by an official of the Ministry of Supply. The fourth paper, by a B.E.A. representative, and the remaining discussion, will be summarized in next week's issue.

THE paper, *Airworthiness of Helicopters and Lives*, was presented by H. E. le Sueur, A.F.R.Ae.S. (Air Registration Board). In his introduction the lecturer said that he would try to formulate an airworthiness procedure which, in his opinion, might satisfy some fictitious Authority—not necessarily the A.R.B.—concerning "safe scrap lives" for helicopters.

The spokesman of this hypothetical Airworthiness Authority, after an argument with the designer, might well specify the following tests for this "airbeating monstrosity," the helicopter.

It would be required to demonstrate that, over the whole extended engine and rotor speed range, no resonance occurred in any of the shafting and transmission; there should be no undue vibration anywhere in the cockpit, passenger cabin or of any part of the rotorcraft where vibration was likely to cause discomfort to passengers or crew, and damage to freight; and no flutter of any part of the lifting, stabilizing or control surfaces and rotors. The engine and rotor speeds should be extended beyond their normal operational ranges by an agreed amount. The above tests were to be done on the ground and over the full flight speed range, forwards, backwards and sideways in the air.

Strain-gauging during this general vibration and resonance testing should be of an exploratory nature, and it would be necessary to investigate more thoroughly the critical parts of the rotorcraft under the operational conditions where it was found that stresses or strains were likely to be criteria.

Ground tests, continued the lecturer, should be made to include the starting up of engines with rapid acceleration during clutch engagement (if applicable) and over the full speed range up to maximum demonstrated engine and rotor speeds, and the movement of the flying controls over the full practical range. It should also be demonstrated that no undue stresses or deflections occurred when moving along the ground over surfaces of a maximum roughness, to be defined, both under the machine's own power and when being towed. Any specified ground locks might be engaged during these tests to avoid any undue damage.

In flight the rotorcraft, particularly the rotors and that part of the flying controls in the vicinity of the rotors, should be strain-gauged over the full speed range, forwards, backwards and sideways, and up to the maximum altitude. All the usual helicopter manœuvres should be explored, e.g., turns, pull-ups, hovering, etc. The strain-gauging should cover simulated engine failure, auto-rotation if the rotorcraft was single-engined, or if such a manœuvre was scheduled as a normal flight procedure in a multi-engined craft, and change from auto-rotation to power-on. The investigation should cover all possible forms of take-offs and landings up to the prescribed maximum take-off and landing speeds.

For metal spars, if the part was made of a material for which a maximum stress-frequency fatigue (or S-N) curve could be obtained, it was suggested that the following procedure be adopted. When the material had a fatigue limit, then so long as the measured alternating stresses were lower than the fatigue limit associated with the appropriate steady stress, and there was reason to believe that there were no stress concentrations, such a part need not be lifed.

The lecturer suggested that where stress concentrations did occur, for example, bolted joints or a change in section, such parts or the critical joint should be tested for fatigue under loads similar to the most critical found during the strain-gauge investigation. Alternatively, a maximum stress-frequency curve should be determined for the joint. If the material of the part or the joint had no fatigue limit, or if the measured stresses exceeded the fatigue limit of the material or joint, then it would be necessary to assess the length of time that the rotorcraft was likely to be involved in the manœuvres which gave rise to the critical stresses during, say, 100 hours of normal operational conditions.

Having obtained an assessment of the time involved in such a manœuvre, and the frequency of the critical stresses during the manœuvre, and having obtained from the S-N curve the number of cycles over which the material could withstand the critical stresses occurring during the manœuvres, it was possible to assess the safe scrap-life by invoking the "cumulative damage" principle.

In the case of wooden spars (and others), if the part was made of material for which no S-N curve could be obtained, it would be necessary to test the part by loading a specimen or specimens repeatedly. This should be continued until failure under the cases which gave rise to the measured critical strains, or until it could be agreed that a safe scrap-life could be estimated on the basis of information from such previous testing.

A combination of the above two methods might be agreed upon and it was possible that one further alternative was that someone should fly a rotorcraft under operating conditions, and the approved scrap lives of suspect parts on certificated rotorcraft should be a fixed factor below the lives of similar parts fitted to this one rotorcraft. It was hoped that such a procedure would not be necessary, but any flying time that had accrued on rotorcraft of similar design could be taken into account for Certificate of Airworthiness purposes. Where critical stresses arose in occasional unnecessary manœuvres, e.g., running over rough ground, then it might be possible to ban such a manœuvre by suitable wording of the C. of A.

Those parts of the rotorcraft for which the vibratory stresses could not be obtained, and where failure would not cause catastrophic collapse of the structure, should have a safe scrap-life based on vigilant inspection carried out during type and endurance testing of the rotorcraft.

In conclusion, the lecturer stated that operating conditions, wear and corrosion might influence the scrap-life of a part, and these effects would need to be considered in the assessments of the safe scrap-life. There were certain aspects of design which might have to be considered in the assessment. One in particular was the effect of elevated temperatures on fatigue properties.

No mention had been made of the effect of gusts on rotor life and it should be pointed out that, with a flapping hinge, the effect of a gust was to increase the coning angle with little increase of stresses, and the frequency of gusts was much lower than the cyclic stresses which occurred once per revolution, that is, in the order of 20,000 per hour. In the case of non-flapping blades, the stresses due to gusts would be slightly higher, but, owing to their much lower frequency, it was considered that they were still not contributory to the fatigue of the blades.

Licensing of Engineers

Another contribution was by Mr. J. H. Spaull, of the Air Registration Board, who spoke on *The Licensing of Helicopter Maintenance Engineers*. Although much progress might have been made in the armed services and in the factories, Mr. Spaull began, Britain still had no helicopters operating regularly on public transport, and the Board consequently had but few requests for licences for the certification of rotorplanes. Two years ago, there had been difficulty in drafting helicopter licensing requirements, because of the short duration of candidates' experience, and future amendments had been forecast. In April, 1952, these amendments were incorporated in Section "L" of the British Civil Airworthiness requirements. Although, when civil helicopter operation expanded, and more engineers' licences were required, further alterations might be necessary, the present syllabus was quite adequate for the time being.

One of the first reasons for the 1952 amendments was that engineers who were applying for licences in respect of fixed-wing aircraft engines were at a disadvantage when compared with engineers applying for helicopter licences. For aeroplane engines the general experience requirement was two years, whereas in the helicopter case it was only necessary for the engineer to have had one year's practical experience of the maintenance of rotorcraft. This meant that a licence for the same engine could be obtained at different levels of experience.

Another anomaly arose, said the lecturer, when the question of extension was considered. An engineer with a Pratt and Whitney Wasp Junior on his licence in relation to a helicopter could apply for an extension to include this engine in relation to a fixed-wing aircraft when he had only an aggregate of experience of, say, eighteen months (made up of twelve months before he obtained the S-51/Wasp Junior endorsement and six months since) as compared with a minimum of twenty-four months total experience, which was the minimum maintenance experience normally required for any supercharged engine.

It should be remembered that the question of considering the helicopter with its rotor was equivalent to considering the fixed-wing aircraft engine with its airscrew. The holder of a licence in Category "C" for a fixed-wing aircraft engine of the same type which might be installed in a helicopter was not authorized to certify the engine in a helicopter, and the holder of a licence valid for an engine installed in a particular helicopter was not authorized to certify an engine of the same type installed in a fixed-wing aircraft.

However, when the general revision of the requirements for

Two more World Class Records

LONDON—KARACHI

3921 statute miles in 8 hrs. 52 mins.

LONDON—DARWIN

8608 statute miles in 22 hrs.

An English Electric Canberra powered by Rolls-Royce "Avon" engines, has flown from London to Darwin, Australia, via Karachi, in under 24 hours.

(Subject to Official Confirmation)

ROLLS-ROYCE

Aero

ENGINES

FOR SPEED AND RELIABILITY

Aircraft Wheel Assembly achieves 68% longer service life at five pounds less weight

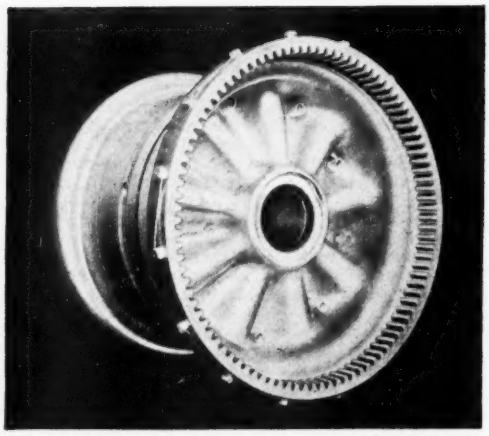
A WELL-KNOWN firm of aircraft constructors has recently found the answer to a landing gear problem. Their twin-engined passenger planes, extensively used on commercial routes, required a more efficient type of wheel brake assembly. They specified that it was to be lighter, and at the same time have a longer service life than the assembly then being used.

The answer was provided by the Aviation Division of the Goodyear Tyre & Rubber Co. Their background of experience and research in this field enabled them to design and manufacture a single disc wheel and brake assembly that weighed 5 lb. less yet gave 6,300 more landings before replacement.

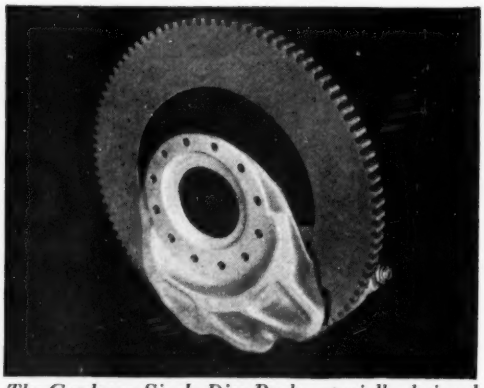
LESS SERVICING NEEDED

In addition, the brake assembly requires the minimum of servicing. Automatic adjustment keeps clearances constant throughout the whole life of the linings; manual adjustments are unnecessary.

The Goodyear Aviation Division can help you with your landing gear problem, too. Technical Representatives are always available to give advice, or to join in consultation with your own design staff. They will help you see the job through, from the drawing board to installation.



The Goodyear wheel, cast from magnesium alloy, is of divided construction comprising inboard and outboard halves which greatly facilitate the mounting and dismounting of tyres.



The Goodyear Single Disc Brake, specially designed for the wheel, completes a thoroughly integrated wheel and brake assembly of high performance.

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DISCUSSING HELICOPTER MAINTENANCE . . .

licences was made in April, 1952, the aforementioned anomalies were removed. By that time, it was possible for engineers to have accumulated the experience which the Board desired to prescribe, and the experience requirements were therefore amended accordingly. Another amendment was the removal of the limiting weight of 6,000 lb which, in the 1949 version, had been inserted as a precautionary measure.

Having regard to the development of larger types of helicopters between 1949 and 1952, continued Mr. Spaull, the requirements now prescribed would, in the opinion of the Board, meet the sort of maintenance standards for any type of helicopter in the forseeable future. In addition to prescribing longer periods of general engineering experience, the licence had been sub-divided so that it might be endorsed for unsupercharged or supercharged engines. The position now was that :—

(1) Applicants for the grant of a licence for the certification of unsupercharged piston-engined helicopters must have had at least three years' general engineering experience, including periods totalling one year on the maintenance of helicopters (including engines). In addition, applicants must have had recent practical experience of the maintenance and inspection of the particular type of helicopter (including engine) concerned.

(2) Applicants for the grant of a licence for the certification of helicopters with supercharged engines must have had at least three years' general engineering experience, including periods totalling two years on the maintenance of engines before flight and, of this, at least one year must have been on the maintenance of helicopters with supercharged piston engines, including recent practical experience on the particular type of helicopter (including engine) concerned. Where the applicant already held a licence in Category "C" valid for a supercharged piston engine, the total experience required might be reduced to one year, all of which must have been spent on the maintenance of helicopters, including recent practical experience on the particular type concerned.

The Board had not, at this stage, prescribed conditions for the grant of a licence to certify jet-operated helicopters; if, however, such a case arose, the Board would undoubtedly base its decision on its requirements for turbine engines in fixed-wing aircraft, in relation to the present requirements for helicopters.

It should be noted that, as with the overhaul and repair of fixed-wing aircraft (including engines), where the Board had limited the extent to which such licences might be issued, similar action would be taken with the helicopter. It was not the intention of the Board to consider licensing individuals for the overhaul and repair of helicopters, and consequently there would be no "B" or "D" licences for helicopters.

To deal with the problem of licensing personnel for the certification of helicopters now being developed and tested, the Board had appointed surveyors who, from the earliest stages, would investigate the relevant problems. Thus, by the time applications were made for such helicopters, these surveyors would be thoroughly conversant with the types concerned, enabling the Board to continue its policy of presenting practical and worthwhile examinations.

Maintenance Methods

Maintenance—Some of its Broader Aspects and Implications was the title of the paper presented by Mr. A. McClements, A.R.T.C., M.I.Mech.E. (Ministry of Supply), who began by defining the purpose of maintenance. Maintenance, he stated, was not an end unto itself, and was not just done for the fun of it. Rather was its purpose to carry out work in close association with other quite different types of work, so that the integrated effort enabled the equipment in use to perform satisfactorily the task in hand.

Engineering effort in an operating concern, however good in respect of its detailed labours, was not good enough unless it arranged the overall result of its actions to suit the organization as a whole. It was the speaker's intention, with this in mind, to try and indicate some of the points which might guide the maintenance engineer endeavouring to fit his actions into the broader pattern of his organization in the interest of overall efficiency.

The absolute "life" of a commercial aircraft was : Available periods for revenue flying (A), plus periods when revenue flying was not possible because the machine was being maintained (C).

One of the things in which the operator was interested was the fraction of the aircraft's "life" which was available to him for revenue earning. The lecturer called this the Utilization Potential Factor (U.P.F.) because it was the factor which gave a direct measure of the very best utilization potential which the engineering group made available. Clearly :

$$\text{U.P.F.} = \frac{\text{Available Periods for revenue flying}}{\text{Available Periods for revenue flying} + \text{Unserviceable Periods}}$$

A graphical plot of this relationship showed that below a value of the A/C ratio of about three (which meant three hours flying for one hour grounding on the average), small improvements in the grounding time, not associated with curtailment of the flying time offered, resulted in quite big improvements in the possible utilization. Above this figure (which corresponded to an available annual utilization of some 6,500 hours) the trend was not so marked.

Hence it could be said that, until the maintenance engineer could offer much higher annual utilizations than he now offered, anything he could do to keep down the standing time associated with maintenance had an important effect on the earning potential of the machine. The operator was not concerned only with one machine, but with a fleet which at any time comprised aircraft engaged on revenue earning and reserve aircraft. He obviously wanted the maximum number of his fleet engaged on revenue earning and the minimum number engaged in a reserve capacity. By just offering him the lowest possible accumulated standing time over a period, we were not doing enough to keep down his number of reserve machines because, in a block of time, we might have periods of grounding of very irregular lengths.

If such was the case, reserve aircraft had to be held available to stand-in during the long periods of grounding. On the other hand, if our total time of grounding in a block of time was made up only of a lot of short periods, it might be possible to avoid the planned use of reserve aircraft completely.

The achievement of improvement in standing time over the complete maintenance cycle was only worthwhile if any extra cost which it involved was more than offset by the profits which the aircraft could make in the extra flying time offered. Also, the achievement of a regular cycle of only short periods of planned grounding time throughout the maintenance cycle was only worthwhile if any extra cost which it involved was more than offset by the saving in reserve aircraft costs.

Summarizing, said the lecturer, he was suggesting that the maintenance organization might profitably aim at :—

1. Cutting down the total standing time associated with the whole maintenance cycle.
2. Manipulating the maintenance cycle in such a way that it comprised only short periods of grounding time.
3. Arranging its methods such that 1 and 2 could result in an attractive economic balance.

Considering each of the above qualities in turn, the argument could be continued on the following lines :

1. The duration of the total standing time would be influenced to a large extent by the total amount of work to be done—in other words, by whatever was called up in the maintenance schedules. The duration of the standing time would also be directly influenced by the layout of the machine and the accessibility of its parts. Hence, if it was required to cut down the standing time as much as possible, it was clearly necessary to prune the maintenance schedules such that, when the aircraft in question went into service, the schedules were truly realistic; it was also essential that the machine should have been designed for easy maintenance.

The contents of the maintenance schedules and the ease with which maintenance could be carried out rested largely with the manufacturer of the equipment. However, the maintenance group could co-operate with advantage with the manufacturer, in watching points such as the efforts being devoted to the establishment of the "lives" of components and assemblies; the amount of attention being paid to installational detail; the care being taken to keep systems simple; the safety devices being introduced; the disposition of ancillary equipment; the trouble being taken to make refuelling, oiling and greasing easy; and the skill required for the assembly of components.

2. The maintenance cycle would say what must be done and the stages in flying hours when it must be done. In practice, what had to be done would include, *inter alia:*

(a) The addition of fuel and oil after stated intervals of flying.
(b) Cleaning of airframe and cabins after stated intervals.
(c) Greasing after stated intervals of flying.
(d) Visual inspection of each part of the aircraft after stated intervals of flying.
(e) Removal, overhaul and replacement of components when their "lives" were up.

This work might be done in two ways :

(i) The maintenance cycle would state that after periodic intervals of flying, certain blocks of work must be done. These blocks of work would be of the type (a) to (e) above, and they would recur several times over the complete cycle. Now, the work which the cycle stated must be done after, say, F hours flying, might be *all* done at F hours flying, the aircraft being grounded for the time required for *all* of the work to be done.

(ii) Instead of doing all the work which must be done after F flying hours at F hours, it might be better to do some of this work before F hours, thereby cutting down the required grounding time at F hours to that necessary for the remainder.

Since the periods between items (a), (b) and (c) above were likely to be of short duration, it was likely that it would only be

(*Concluded at foot of page* 194)

AIRCREW TRAINING

—for Civil and R.A.F. Needs: a Suggested Scheme

By F. A. CHAPMAN

CONCERNED at such matters as the cuts in the Reserve schools, and the general uncertainty bred by occurrences of this kind, the author of this article suggests a five-year training scheme, which, while largely based on existing facilities, displays some original features. He writes from practical knowledge as chief instructor at No. 19 Reserve Flying School, Woodvale, near Liverpool, which is operated by Short Brothers and Harland, Ltd.

SINCE the war a rapidly expanding civil aviation has been able to draw on a large pool of trained ex-R.A.F. personnel for its new and replacement aircrew. This source of supply will continue over the next few years, as short-service and National Service aircrew become redundant.

But do the civil airlines and Corporations want these men? The short-service people now returning to civil life, or soon to return, are ex-war pilots, and therefore too old to have a useful length of flying life left. The National Serviceman, on the other hand, is generally too young and inexperienced; and in any case, having thrown up military flying as a career, he is unlikely to take up civil flying as a livelihood. Additionally, as the stated policy of the Services is to retain only the cream of its aircrew, surely civil operators should not be satisfied with less than the best aircrews for its passenger transport. In the foreseeable future even this small pool of trained aircrew may dry up. It seems likely that, with the advent of such bombers as the Vulcan, Service pilots will be few in number, will be comparatively high ranking and be employed solely on piloting for many years.

It appears obvious, then, that civil aircrews will have to be recruited and trained from the young, raw material. Not least of the difficulties of instigating such a policy will arise in obtaining the right type of man, and this object can be achieved only by offering a long-term policy—in other words, the prospects of a life career. Unfortunately, flying is still not looked upon as a career, even by many of those actively engaged in it. Such trends of thought must be eradicated, though the difficulty of doing so becomes apparent when one looks back on the frustrations of the post-war years, the mass of redundancies, and the succession of gluts and scarcities of aircrew, culminating in the recent short-sighted axing of basic and Reserve flying training schools.

To attract the right type of man, then, a suitable career must be offered and, as with all other professions, men must be guided to think along the lines of their chosen calling at the earliest possible age. It is still true to say that the younger the man the more easily will he absorb flying instruction; but with the complexity of modern aircraft, a pilot should not go on to productive flying, either civil or Service, until the age of 23-25, when he still retains the fire of youth yet is mature enough to know where he is going. I am convinced that one of the reasons for the small percentage of National Service aircrew wishing to stay on in the Service is because too-young youths have been too-quickly taken on to too-fast aircraft. In other words, experience is gained not simply by flying hours, but by those hours spread over a period of time. The training scheme I have in mind envisages a start of active training at between 17 and 20 years of age, carrying through probably seven years before becoming fully productive.

The next major item is cost. Obviously, individually financed training is out of the question. It would also be unfair to ask the Corporations to bear the whole cost when they stand to lose men to private airlines or the Services. One feels that most of the initial training costs should be born by the Air Ministry, since every trained pilot is a potential war pilot. The training scheme, then, can be envisaged as a mutual civil-R.A.F. scheme. It would be built around these four major points:—

(1) Flying must offer a career.
(2) Training would aim at turning out fully qualified pilots or other aircrew at approximately 25 years of age.
(3) Initial training would be carried out to the mutual benefit of both service and civil aviation.
(4) Economy of operation would be constantly kept in mind.

To fulfil Point 1, aspiring aircrew would be signed on between the ages of 17 and 20 on a five-year, part-time or reserve engagement. At the end of the five years, the man would be given an option of (a) joining the R.A.F. on a long-term engagement; (b) joining a Corporation or civil flying company; (c) leaving flying altogether, but being retained for five years on the R.A.F. non-training reserve.

Pay would be on similar lines to that obtaining in the present university air squadrons, with a bounty of, say, £50 per year; but this bounty would be payable only at the end of five years and then only to those entering the R.A.F. or civil flying. Such a scheme would give the budding aviator sufficient long-term security and prospects to encourage him to carry through his training, but at the same time would leave him a loophole for turning in his hand should he decide that flying is not in his blood; and he could do so with the knowledge that he would not be unemployed by so doing, and could carry on with his normal trade.

To fulfil Point 2, training on the five-year engagement would be at the rate of 80 hours' flying and 80 hours' lectures per year. Thus, in five years—and, say, at the age of 23 or so—the men would have carried out 400 hours' flying, and have achieved proficiency at least equal to the present "wings" standard achieved. A further one to two years' advanced training in his chosen branch would produce a man with a good length of flying experience and one sufficiently mature to captain a valuable modern aircraft.

With regard to Point 3, and bearing in mind cost, the initial five years' training would be carried out on the following lines:—

First Year.—Eighty hours' basic flying training on Chipmunks, with 15 days' continuous training in the early solo stage.

Second Year.—Eighty hours' flying on Chipmunks; 15 day' scontinuous training to Instrument Rating standard.

Third Year.—Eighty hours' flying, 15 days' continuous training used to convert on to a twin-engined aircraft (e.g., Oxford or Anson).

Fourth Year.—Eighty hours' flying plus one month attached to an R.A.F. unit, converting to jet aircraft.

Fifth Year.—On twin-engined aircraft; 15 days' continuous training aimed at giving experience in the greatest possible number of types of instrument approach-aids, both Service and civil.

The above scheme is based on the supposition that 80 hours' flying is the maximum that can reasonably be done in one year. The months at an R.A.F. unit would give the pupil an insight into Service life. With Point 4 in mind, maximum use is made of part-time training, thus eliminating much of the financial loss incurred when a full-time, three-parts-trained pilot is either "scrubbed" or throws in his hand. This five-year, part-time training would be carried out by civilian-operated schools (as at present operating as Reserve Flying Training Schools) far more economically than by either the R.A.F. or the Corporations. Such schools have had long experience of this type of work and over the past 20 years have become the backbone of *ab initio* flying training in this country. The scheme would be financed by the Air Ministry, but airline companies would pay a certain sum for every pilot they took from the pool.

This scheme, one feels, would benefit both the Corporations and the R.A.F. by providing pilots (trained to a fairly advanced standard at the most useful age) for advanced aircraft; and it would do so at a reasonably low cost by using, in the main, an already constituted and well-tried training set-up.

The numbers to be trained in this scheme are obviously a matter for high policy, but it is suggested that an intake of 25 pilots per year by each of 20 schools would be almost sufficient for both civil and R.A.F. needs with present types of aircraft. Training for other aircrew could be broadly on the same lines.

DISCUSSING HELICOPTER MAINTENANCE

(Continued from page 193)

worthwhile operating items (d) and (e) in the way mentioned in the latter alternative. In view of the probable regular operating pattern, the second alternative was the more attractive, because it aimed at spreading the grounding period dictated by the maintenance cycle into a number of blocks of time in such a way that *all* maintenance work necessary could be done *when the aircraft was not required for revenue flying*. The first alternative would be preferable only where flying was at a low rate and of a non-regular nature. The other might be termed the "progressive system."

(3) The most likely way of achieving efficient labour effort was to employ the labour force at a steady load continuously and not in a series of high activity periods followed by periods of inactivity. The "progressive system" of maintenance thus clearly helped to achieve an attractive economic balance.

In his concluding remarks, Mr. McClements referred to the frequent confusion between maintenance implications and operational considerations, and to the manner in which the concept of the "Utilization Potential Factor" could help to reduce this confusion. The practical application of the progressive system of maintenance had been found not to be over-formidable, he concluded, as it had been used during the B.E.A. Liverpool-Cardiff passenger helicopter service—indeed, it had made it possible.

We hope to print a summary of the fourth main paper, by Mr. W. L. Shippey, of the B.E.A. Helicopter Unit, and of the other contributions to the discussion, in next week's issue.

X. The Times Dec 13

MASS PRODUCTION OF SAPPHIRE ENGINES

U.S. AIR FORCE ORDER

WASHINGTON, Dec. 12.—Mr. Gilpatric, Under-Secretary of the United States Air Force, announced to-day that orders had been given for the British-designed Sapphire jet engine to be mass-produced and he expected hundreds of them to be delivered within the next six months.

The Sapphire, he said, "has successfully passed the rigid 150-hour model test which the Air Force imposes on all new engines before releasing them for mass production. We are extremely optimistic concerning the future of this engine as a result of its excellent performance in recent flight tests in the first F 84 F (Thunderstreak) aeroplane."

He said the Sapphire engines were now in use in some operational aircraft, and a "considerable number more" were coming from the aircraft factories. The Sapphire engine was designed by the Armstrong Siddeley Company in Britain, and is being produced in the United States by the Curtiss-Wright Aircraft Company and the Buick division of the General Motors Corporation.—*Reuter.*

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ROYAL AIR FORCE
FLYING TRAINING

"... Eventually every pilot will be trained by the PROVOST ..."

From a reply given in the House of Commons on the 17th December 1952, by the Hon. G.R. Ward, M.P., Under Secretary of State for Air.

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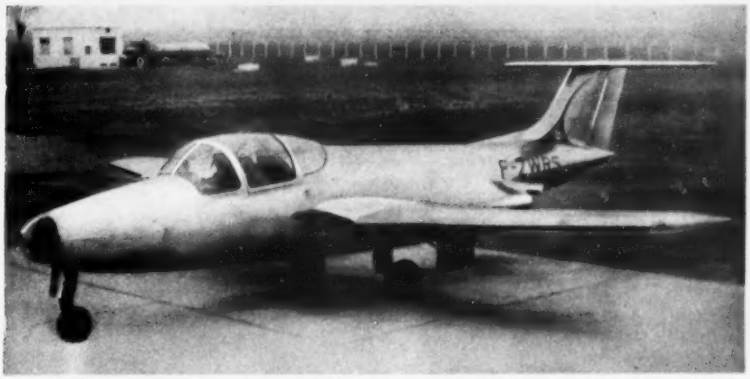


TWIN-JETTERY : The McDonnell F2H-3 Banshee (above) is the subject of a paragraph on this page. Below it is the first photograph of the Morane Saulnier MS 755 fighter trainer, which has now flown at Melun-Villaroche. Described in our issue of January 9th last, the MS 755 is powered by two Marboré II turbojets; like those of the Banshee, its auxiliaries are all-electric.

France

New Bréguet Projects. Although much of the time of the Bréguet design-staff is taken up with the Deux Ponts transport and the Vultur carrier strike aircraft (one of which is now at Farnborough, as we predicted two weeks ago), the following designs are now being considered: Type 1001 and 1002 ground-attack fighters, with an all-up weight of 8,000 lb; Type 1020 artillery-observation aircraft; and Type 1030 convertiplane, whose fuselage-mounted turbojet feeds two tip-drive rotors normally retracted into the wing.

Switzerland

New Fighters. The Federal Aircraft Factory at Emmen, near Lucerne, has been experimenting with advanced fighter projects for several years. The N-20 glider, with a shape reminiscent of the Douglas Skyray tailless fighter, was flown in 1950. A later development, upon which work is progressing, is an unusual four-jet fighter, also styled N-20. This is to have four Armstrong Siddeley Mambas "modified in Switzerland to turbojet form"—although the parent company have already done this in the Adder. In the meantime, a six-tenths scale model is being built, powered by four Turboméca Piménés. An even more unlikely project is the N-2020—also a tailless design, but powered by two turbojets totalling 15,000 lb thrust; two Sapphires have been suggested.

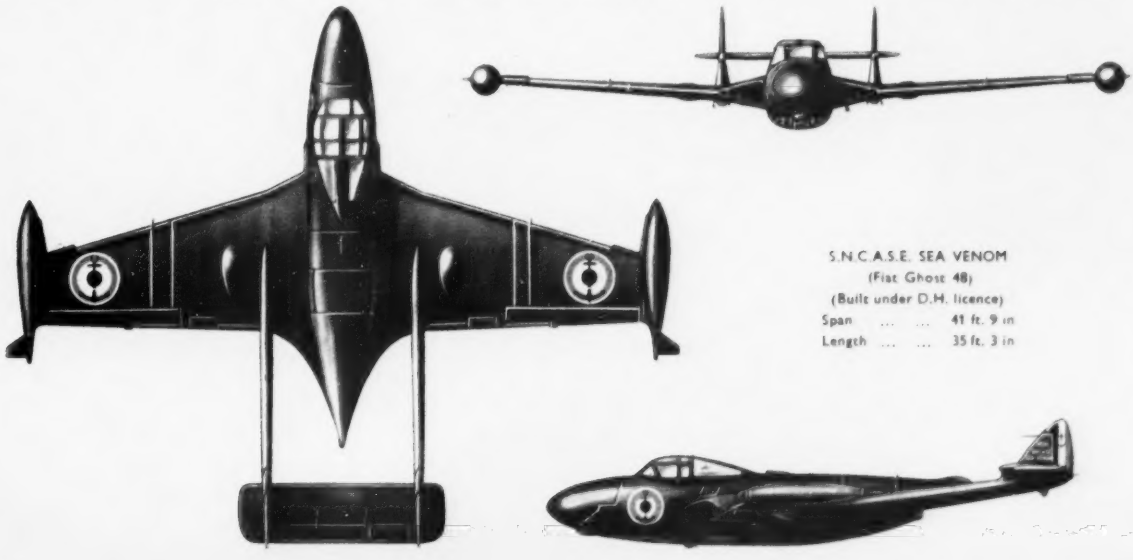
U.S.A.

Fairchild C-119. One of these large military transports is being equipped with a small auxiliary turbojet to provide emergency power in the event of take-off engine failure. *Aviation Week* has it that the engine—a Fairchild YJ-44 of some 1,000 lb thrust—will be mounted in a cradle in the roof of the fuselage, so that the unit can be retracted when not in use. This may become standard on the later C-119s; some of these aircraft, incidentally, are to be completed as flight-refuelling tankers, with 12 tanks of transferable fuel.

McDonnell Banshee. Illustrated on this page is a production F2H-3 from St. Louis—one of the first of this bigger and heavier sub-type to be seen. The most obvious superficial feature is the unpainted, anodized finish, which reduces weight and skin-friction while improving corrosion resistance. The F2H-3 can carry an underwing load even greater than that lifted by the earlier Banshees; other improvements include extra tankage, a larger, low-mounted tailplane and additional electronic gear.

North American Sabre. Several types of Sabre are now being built with many parts formed from titanium—both to reduce weight, compared with steel, and improve resistance to high temperature, as compared with light alloy. In particular, the afterburning F-86D all-weather fighter incorporates more than 600 lb of the new metal—a remarkable amount equivalent to over 10 per cent of the basic airframe weight.

Republic XF-84H. Contrary to earlier reports, this experimental aircraft will not be powered by an Allison T-40 double turboprop—as is the Skyshark. Instead, a Wright T-54 is specified; this turboprop has been developed from the Armstrong Siddeley Sapphire (also built by Curtiss-Wright) in order to provide a single-unit engine of 10,000 s.h.p. In the Thunderjet test-bed the T-54 will drive a supersonic Curtiss "biplane" airscrew formed from two tandem-mounted, three-bladed, small-diameter units, turning at high r.p.m.



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(Fiat Ghost 48)
(Built under D.H. licence)

Span	... ...	41 ft. 9 in
Length	... ...	35 ft. 3 in

THE PROBLEM OF THE

Photographs by Fairchild Aerial Surveys

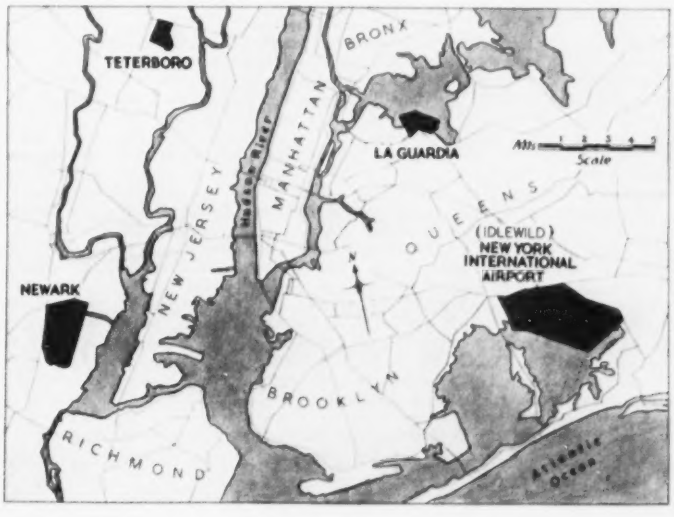
CITY AIR TERMINAL

IT is our fear that the already serious problems associated with major airfields in and near cities, and the complaints of residents living nearby, are but a small beginning of what must be expected in the future. Whether or not the aircraft or the resident staked the first claim is of no importance, because air transportation and its airfield-needs will go on and expand enormously while the complaints of residents, which in many cases are not without justification, can never be summarily dismissed or simply dealt with. And it is not only airport problems which must be expected; already communications, particularly the highways serving main airports, are seriously congested.

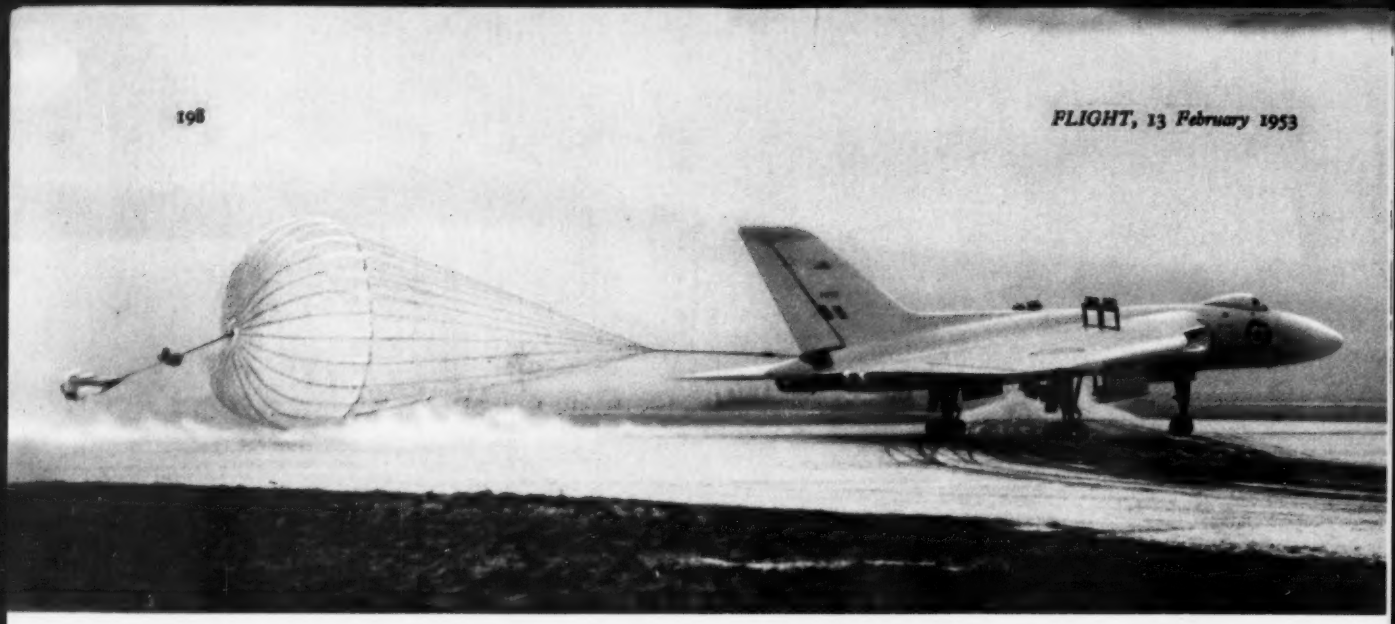
We print these fine aerial views of New York's three best-known airports both because of their intrinsic interest and because they are illustrative of the place occupied by major airports in the modern community.

Not long ago we referred to a lengthy printed report, "The Airport *and* Its Neighbours," which had been prepared for President Truman by a committee headed by Major "Jimmy" Doolittle. The problems discussed are just as much ours as those of America, and we may quote from that report as follows :—"The chief objective of all communities is to create a favourable environment in which to live. Experience has shown that this environment does not just happen; there is a genuine need to control the forces which determine environment. If we are to avoid compounding our difficulties it will be necessary to keep two ideas in mind : first that airports must be planned as a part of the total system of metropolitan transportation and land use; and, second, that a sound idea of an optimum pattern must be created so that immediate actions can build up to more than piecemeal and contradictory results." Later in the Report these remarks appear : "One of the criteria of the idealized plan is the single runway airport . . . the single or parallel runway principle is the basis for determination of land uses and obstacle restrictions in the runway approaches. The influence of airports on land uses and land values can thus be restricted to a limited segment of the airport periphery." Reverting to our mention of highway congestion, we may further quote from the Report : "Some experts anticipate a 75 per cent increase in highway traffic in the next 25 years."

Finally, it would be wrong to suppose that helicopters will not bring with them some of the problems already associated with fixed-wing transports, and early planning is just as important. The Doolittle Committee remarks "Interested Government agencies should encourage helicopter development for short-haul use, emphasizing safety, reliability and public-toleration factors."



The map on the right indicates the position of four main New York airfields, while the photographs, reading clockwise from the left, depict: (1) The 4,900-acre New York International Airport known as Idlewild. Runway areas of up to 9,500 by 200ft are provided for. The terminal building comes near to being a self-contained community with 24-hour restaurant, shopping centre and banks. (2) The new instrument runway with white guide-lines at Newark Airport, N.J. (3) Another view of Newark Airport as a whole. It occupies 2,300 acres, and its eight hangars take up the same ground area as do the five at Idlewild. (4) The familiar outlines of La Guardia—New York's international terminal until Idlewild was built—with Manhattan's skyscrapers in the background. La Guardia occupies only 550 acres—a fraction more than Teterboro.



MODERN BOGIES

Problems posed in the Design of Undercarriages for Fast and Heavy Bombers

By W. T. GUNSTON

NOTORIOUSLY, undercarriages often suffer worse treatment than any other part of an airframe, and they do not always suffer it in silence. To some extent, the landing-gear gets more than its fair share of pity, for the pummelling which it receives is far more obvious than are the severe loads imposed on the primary structure of the airframe, but the design of landing-gear for heavy modern aircraft is an unusually difficult task, particularly when retraction has to take place into a high-speed wing of low thickness/chord ratio. It is the intention here to examine some of the design considerations involved, with particular reference to the Dowty undercarriage used on the Avro Vulcan, and the Electro-Hydraulics undercarriage of the Handley Page Victor. These two impressive bogie units are representative of the best British practice, and appear to be of a more advanced conception than any other type of landing gear yet developed anywhere in the world.

At this point, it may be recalled that other companies are engaged in bogie manufacture. The Britannia uses Messier units, the Beverley undercarriage is by Lockheed, and the bogies of the Comet are by de Havilland themselves. Incidentally, the Valiant is not bogie-equipped but employs a Vickers-Armstrongs undercarriage of unusual configuration.

In the United States, post-war bomber specifications have usually been met by employing the thinnest possible wing consistent with the maintenance of reasonable low-speed and landing characteristics. A corollary of this decision has been—as has frequently been pointed out in these pages—the relegation of the power plants to external pods and of the undercarriage to the fuselage. This in turn has resulted in large fuselages housing great quantities of fuel as well as the main landing gear—a practice hardly capable of efficient adoption on a civil transport, and of doubtful advantage in any aircraft.

In this country bomber specifications have roughly paralleled those of the United States, but the English design-teams have universally chosen much lower wing loadings and, further, have attempted to design aircraft capable of operational use from existing airfields. As a result, the larger wings seen on the British bombers have permitted complete housing of the engines and undercarriages within their profile, while yielding nothing in the matter of thickness/chord ratio. Again, the accepted runway-loading index has forced the British undercarriage designer to spread the load over a considerably greater area than his American counterpart with consequent gains in aircraft flexibility of operation.

Before going on to consider the factors affecting the design of the two aforementioned bogie units, attention may conveniently be turned to the American layout. The adoption of fuselage-mounted main legs has removed from the wing the concentrated upload normally experienced, but has brought new problems. A concentrated load is imposed at two points on the fuselage of such aircraft as the Boeing B-47 and B-52, with consequent weight penalties in the fuselage structure. Ground stability is not good, even with outrigger wheels; in particular, it appears that the B-47 is difficult to land in a cross-wind and has a tendency to ground-loop. The front wheels of a "bicycle" undercarriage must necessarily be steerable, and this is no easy matter. Furthermore, the already heavily-loaded front wheels are placed under still greater stress during braking, for they have to carry a considerable nodding load from the whole structure. Even when a braking parachute is employed, the stopping of these American bombers is a somewhat difficult and costly operation, and the touchdown speed and attitude have to be within very narrow limits.

The Handley Page Victor, with its thin wing, posed a most formidable problem which Electro-Hydraulics, Ltd., have been able to solve only by use of a rather novel linkage and an intriguing method of retraction; reference to the G.A. drawing of this undercarriage will show the remarkable manner in which it has been made to fit within the contour of the wing. The Vulcan, however, with its thickness/chord ratio of about ten per cent and enormous root chord, reduced the storage problem for the Dowty designers; the accompanying drawing shows well the manner in which this bomber's undercarriage lies within the wing with space both above and below. But the Vulcan undercarriage is of such excellent design that it could still be employed even if the Vulcan's thickness/chord ratio were reduced to, say, seven per cent.

The airframe designer is anxious that the wing torsion-box shall not be too severely cut open for retraction purposes. In this respect, the Vulcan again has an advantage in that the inter-spar chordal space is unusually great. In the Victor, the main spar is located well forward of the undercarriage stowage space, and the retraction linkage adopted has been a further asset in reducing the gap in the lower wing-skin.

The drag of undercarriages of this size is quite appreciable, amounting to several thousand pounds at the wheels-up safety speed. This figure has to be accepted and it is unlikely that it would affect the design of the undercarriage. The capacity of the retraction system is determined by the amount of work to be done in retracting the undercarriage in the time specified in the *Manual of Design Requirements*. The Vulcan uses a Dowty hydraulic system and the Victor an installation by British Messier, both of which companies have developed systems working at 4,000 lb/sq in. The main bogies of both bombers have to be retracted forwards, against the slipstream.

The actual attachment of the undercarriage must be made in

ejection seats

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Once ejection is made, the complete sequence of releases from the seat are automatic and no further action by the occupant is necessary.

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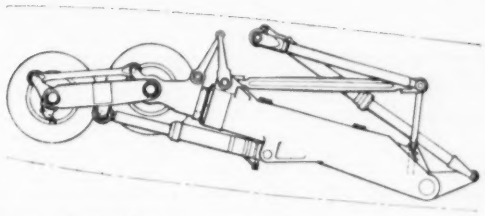
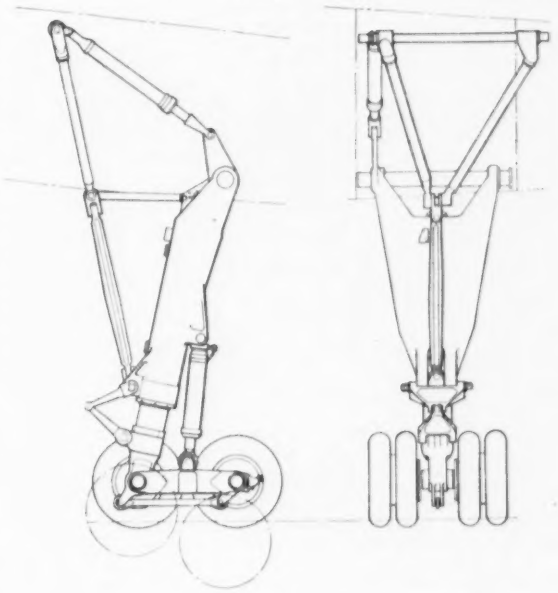
MODERN BOGIES . . .



The main bogie of the Avro Vulcan is a Dowty unit. It employs but one shock-absorber and conceals the brake piping within the massive, hollow main leg. Both drawings on this page show the free-trail wheel position as a broken line.



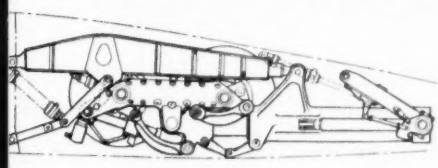
a manner suitable to the airframe designer, who must be allowed to lay down the best structure without reference to the undercarriage designer. In the Vulcan, the undercarriage lies alongside the outer engine ribs; nothing is yet permitted to be said of the undercarriage stowage of the Handley Page Victor.

The landing gear of the Vulcan is unusually long. This permits advantage to be taken of the high angle of attack possible with a flapless delta both at take-off and landing. This nose-up condition can, to some extent, be offset by streaming the tail parachute, but one cannot rely upon this always being the case with a bomber in squadron service. In any case, the tail parachute, while raising the tail considerably before touch-down, also increases the angle of glide, and therefore the rate of descent. Another peculiarity of tricycle undercarriages occurs in the take-off condition. Backward movement of the control column raises the nose and also causes the centre of gravity of the aircraft to move rearwards; this, in turn, results in an increase in the nose-up moment, which must be counteracted by returning the control column to neutral or even by moving it farther forward. This is more marked on a delta because of the short elevation moment-arm when in the static position. The Vulcan also has a lengthy nose leg; this unit experiences somewhat severe loading during braking, but the design is carried out to cater for the even more severe three-point landing case.

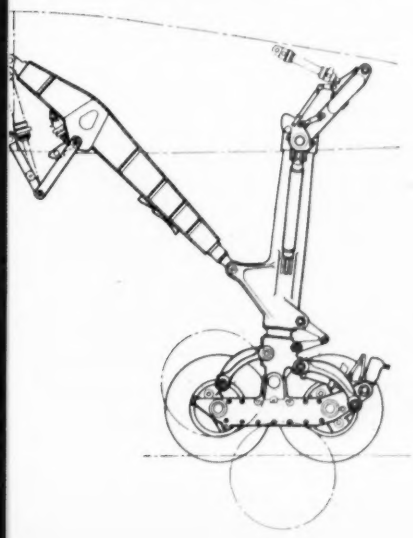
One of the most difficult problems in the design of a tandem-wheel bogie unit is the prevention of excessive loading on the front wheels. Two factors can cause such overloading: "slamming" of the front wheels on to the runway at touch-down, due to the bogie-beam geometry, and overloading caused by brake torque reaction. The former can cause immediate bursting of tyres as a result of excessive dynamic overloading, and this trouble was first manifest with the Convair B-36 which, in its early life, suffered from front-tyre bursts to a serious degree. The anti-pitch dampers on the B-36 bogie have since been greatly enlarged with beneficial results; in this country thousands of Comet hours and experience with several other types of aircraft have been amassed without this trouble occurring.

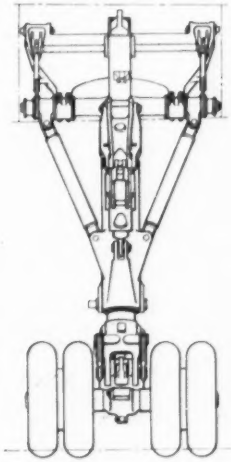
The Electro-Hydraulics undercarriage of the Handley Page Victor has a marked trail angle, with the rear axles hanging considerably lower than the front; a high-capacity damper is employed to reduce the consequent rotational speed of the bogie beam, and so relieve the overloading of the front wheels. This damper also absorbs some of the energy of landing which would otherwise go to the main leg, and helps to ensure a gentle touch-down. The Dowty undercarriage of the Vulcan completely removes this slamming characteristic by its basic configuration. The bogie beam is hinged at the front axle to the main leg. This leg contains no shock-absorber and is free to move inwards, but cannot be pulled out beyond a fixed stop. The main shock-absorber is attached between the rear of the main leg casting and the mid-point of the bogie beam. The rear wheels touch the runway first and rotate the bogie beam about the front axle, which is prevented from moving downwards by the aforementioned stop. This rotation of the bogie beam compresses the shock-absorber, and the front wheels strike the runway with no greater vertical velocity than does the whole aircraft. By the use of this system, only one shock-absorber is needed; this reduces the number of working parts to an absolute minimum.

Overloading is injurious to the tyres, particularly from the point of view of damage to the walls, although the actual wear on the tread is small. Torque reaction caused by braking is of a quite different nature, being applied for considerably longer periods, and also introducing the risk of severe tyre wear, particularly if the wheels are allowed to lock. Brake torque in the first B-36 bogies was transmitted to the bogie beam, a fundamental error that soon became apparent, as this torque can then be counteracted only by overloading the front tyres. In the Vulcan the torque from the front brakes is carried direct to the sliding member of the leg structure, whilst that from the rear brakes also reacts, through parallel linkage, to the main-leg, so that there is no resultant torque applied to the bogie beam. On the Victor, torque of both front and rear brakes is transmitted by links to the main-leg structure with the same result. Many tyre manufacturers will not permit any brake-application overloading at all; they specify tyres designed for the normal maximum loading.



Three per cent of the all-up-weight of the H.P.Victor is the claim made by Electro-Hydraulics, Ltd., for two of these eight-tyre bogies together with the double-wheel nose unit.





It is an advantage (not, perhaps, readily apparent) to trail the bogie beam at an angle such that one group of wheels touches down in advance of the other. By this means, spin-up drag can be halved, provided that the bogie beam is sufficiently resistant to motion to cause complete spin-up of the rear wheels before the front set touch the runway. Usually it is the rear group of wheels which touch first, but the Short S.A./4, with Messier bogies, shows the opposite procedure. In a normal landing, the front bogie wheels of this aircraft touch down first; in this way the rotational moment applied to the bogie beam is reduced because the resultant load line has a shorter moment-arm about the bogie hinge than would be the case if the rear wheels touched first. In this connection, it may be recalled that there have been many attempts at introducing pre-rotation, both by aerodynamic and mechanical means, but that none of these experiments has shown the procedure to be worthy

MODERN BOGIES . . .

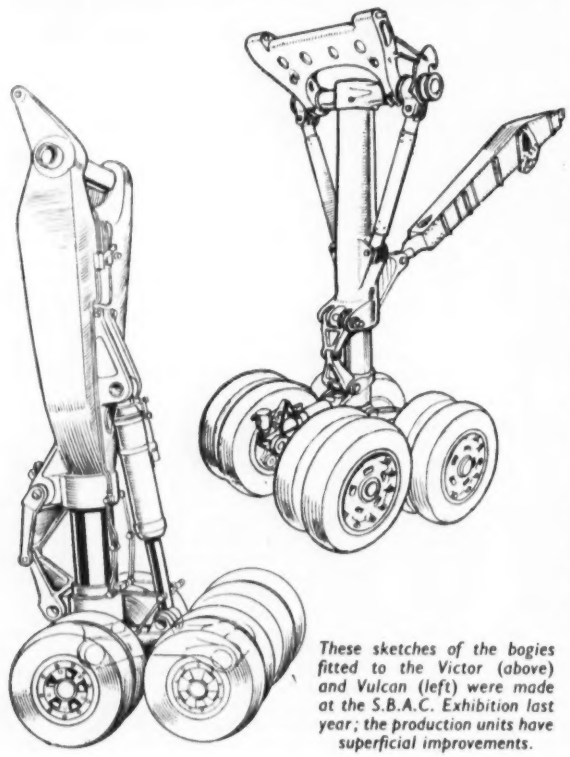
of adoption. In any case, modern bogies would stand to gain little from such a practice.

The arrangement of the wheels on each leg is governed by the runway-loading index. The spacing of the wheels is of greater importance than the tyre pressure, and it is advantageous to spread the load over the greatest possible area of runway, both to prevent distortion of the runway at the point of contact of each tyre, and also to relieve runway bending-moments. The size of tyre adopted is determined by the maximum pressure which can be used and the loading on the tyre. Shortly after the second world war, some attention was given to the "Compacta" tyre, of small diameter and flat profile, excessive tread-width being used to provide considerable ground-contact area. It will be appreciated that the tyre was unsuited to high pressures—which, ideally, demand a circular-section tyre—and "Compacta" development has now been all but abandoned.

Although high-capacity expanding-tube brakes are still being made, this country has turned its attention chiefly to the manufacture of plate brakes. Braking conditions have today reached a somewhat critical stage, where the energy to be dissipated cannot be carried away by slipstream during the landing run. This in turn has demanded the provision of a considerable mass of metal within the wheel, sufficient to absorb the kinetic energy of the aircraft as heat energy—at over 1,000 B.Th.U./sec—without causing undue rise in temperature. Modern plate or disc brakes operate at up to 1,500 deg F, the materials used being either copper for high thermal conductivity, or steel for high specific heat. The wheel is so designed as to maintain tyre temperature within permissible limits.

Regarding brake actuation, it is now considered that a pneumatic system cannot readily be applied to large aircraft, as it is incapable of ensuring instantaneous brake application. Hydraulic systems can approximate to this ideal, and it is interesting to note that the Fokker S.14 Mach-Trainer, which has no hydraulic system, is to go into production with a pneumatic/hydraulic transfer unit for hydraulic brake application.

It is of importance so to design the bogie that an equal load is carried by each wheel during most of the landing run, thus offering the maximum braking power. The brake plate capacity is a function of rim diameter and this is in direct conflict with most modern stowage requirements. Again, civil aircraft require brakes with even greater energy-capacity than those fitted to military types, and it is expected that there will be some rearrangement of the undercarriage on the civil developments of both the Vulcan and the Victor. As a final note upon brake systems, it may be said that, although several types of anti-skid device have been developed to ensure safe application of maximum brake torque, it is essential on a bogie-type undercarriage to fit one of these units to each wheel. If the device were fitted to one wheel only the slightest trace of bogie porpoising could cause all the wheels to lock solid.



These sketches of the bogies fitted to the Victor (above) and Vulcan (left) were made at the S.B.A.C. Exhibition last year; the production units have superficial improvements.

The requirements of modern aircraft tyres are, if anything, even more difficult to fulfil than are those for the remainder of the undercarriage. Particular difficulty has resulted from the enforced adoption of high pressures and, of course, high rotational speeds. In 1945, the average bomber had a tyre pressure of some 70 lb/sq in and could, therefore, be operated from dry grass. Today, tyres are operating efficiently at over 200 lb/sq in and developments are in hand that will increase this figure to above 250 lb/sq in.

High pressures not only make great demands upon the runway surface, but they also imply the provision of new tyre constructional materials. Nylon is being increasingly used in aircraft tyres and, among many other attributes, it is 60 per cent stronger than rayon and has much greater resistance to concussion loading. Terylene shows even greater promise. In all cases, it is the designer's aim to obtain the highest possible strength-to-weight ratio. Incidentally, it may be noted that, although it was British practice during the war to use smooth-treaded tyres, the majority of tyres now in use feature a tread formed from circumferential grooves.

An important factor in the design of wheels is the prevention of the spread of heat from the brakes to the tyres. The type of wheel currently used in the new British bombers has a flat rim with a detachable flange in three segments which lock into a circumferential slot in the wheel. The wheel itself is generally of cast magnesium alloy. This is a convenient point at which to introduce the name of Dunlop. This company is responsible for a vast amount of undercarriage progress, and supplies the complete tyres, wheels and brakes for the Victor and Vulcan.

For any bogie-equipped aircraft, power steering is considered mandatory and a hydraulic system is usually provided for this purpose. For retraction, the nose-leg must be made self-centering; on most modern bombers the limits are of the order of plus or minus 50 deg. On the Vulcan this is accomplished by a specially designed jack which can be extended or shortened during castoring or steering, but which is pressure-loaded to a central position by hydraulic pressure before retraction of the nose undercarriage takes place. The desired centering force for the Vulcan is obtained with a very small jack, weighing only 2¼ lb, which is some 23 lb lighter than a steel spring of comparable performance. Nosewheel centering on the Victor is effected by applying hydraulic pressure to both sides of both the steering jacks, which are brought to a positive centre by virtue of their special design.

Ground manœuvring problems can be acute in bogie-equipped aircraft. If an unduly sharp turn is attempted, the main-wheel tyres will experience severe scrubbing in their sideways movement across the ground, so causing damage to the tyres and a very high torque on the undercarriage. To reduce this effect, a minimum turning-radius is specified for each aircraft type, and is generally enforced by placing a stop on the castoring angle of the nosewheel steering jack. Additionally, a special towing arm may be required for ground manœuvring, used in conjunction with warning lights on the tractor.

Bogie shimmy is rare; even after very severe landings, no measurable play has been discovered either on the Victor or Vulcan. This is partially due to the selection of large pin-diameters with correspondingly reduced bearing pressures. Bogie axles are invariably mounted rigidly in the bogie beam, with each wheel free to rotate independently. On the Vulcan and Victor, each main wheel carries *two* tyres, making a total of 16 in all.

Most large bogie units are built up from large light alloy castings or forgings. The biggest part of the Dowty bogie for the Avro Vulcan is a massive casting produced by Sterling Metals, Ltd., in Z5Z magnesium alloy. Use of this material has kept the weight of the component down to 360 lb; an aluminium alloy casting of the same strength would weigh 540 lb. The Electro-Hydraulics undercarriage of the Victor has two large struts attached, Y-fashion, to the yoke arm; it also has a large girder-type radius-rod with top and bottom extrusions and plate webs. The Victor unit employs a bogie beam formed from two light-alloy forgings dowelled and bolted together to form a box section. The Vulcan bogie beam is a one-piece casting.

It is worth noting that both units are housed in the wing with the bogie inverted. In the Dowty undercarriage this condition is achieved by hauling up the front axle by means of a small trimming-jack in the main-leg; the Electro-Hydraulics undercarriage retracts with the bogie hanging at its acute trail angle, in which condition the front of the bogie strikes a cam situated on the radius rod, thus rotating the bogie beam to the inverted position.

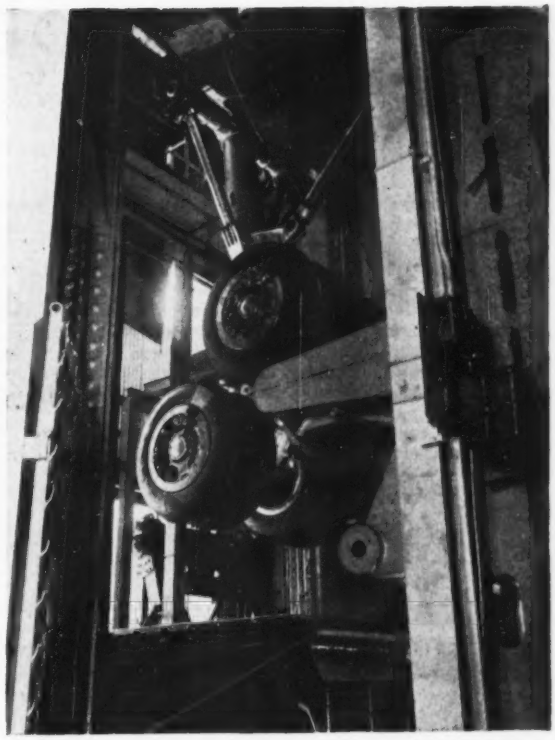
Enough bogie experience has now been gained for it to be said that such undercarriages can be made lighter than those employing fewer, but larger, wheels. The leg itself is usually heavier in

the case of a bogie, but this is more than countered by the greatly decreased weight of the small wheels and tyres as compared with one large one. Provided brake torque is properly allowed for, bogie tyre-life has been found at least as good as that experienced with single-wheel units. On the other hand, initial cost is higher, and the bogie must also introduce added maintenance work.

Particular difficulties attach to the ground testing of bogies and drop testing frequently demands unusual techniques. Electro-Hydraulics are particularly proud of their test rig, which can drop the bogie truly vertically—with wheels spinning backwards at touch-down speed to simulate spin-up drag—on to a pair of sideways-moving synchronized tables. Certainly this rig can faithfully reproduce all modern landing conditions; it is, therefore, an asset which the company is finding invaluable. It is illustrated in the adjacent photograph.

Of future undercarriage prospects, it may be argued that the bogie can always replace the single wheel with advantage. This is not the case, and fighters in particular are unlikely to appear with bogies. This is largely owing to the impossibility of designing high-capacity brakes within the limits set by wheels of very small diameter. The track-type undercarriage appears to have possible applications, although the "unsprung weight" is here very high. An interesting development by Count Bonmartini in Italy involves the use of a row of wheels carrying a track-type pneumatic tyre tank-fashion, the tyre itself being of rubber with steel bands to take the end-load. Spin-up drag is, of course, high, but it has been suggested that a modern British four-engined bomber with a Bonmartini undercarriage could have a tyre loading no greater than 50 lb/sq in, and therefore be operated from grass.

The final development in undercarriages is, paradoxically, their elimination. Flexible-deck experiments have been undertaken for several years with success, and this sort of technique might possibly become universal for fighters. It permits considerable weight-saving, at some expense in ground manœuvrability. On the other hand, passenger-carrying aircraft are unlikely ever to lose their wheels. The flexible-landing-mat technique imposes disconcerting decelerations of approximately four g, and it also demands unusually accurate flying at the touch-down to ensure proper engagement of the arrester hook.



A Victor bogie in the Electro-Hydraulics moving-table drop test rig.

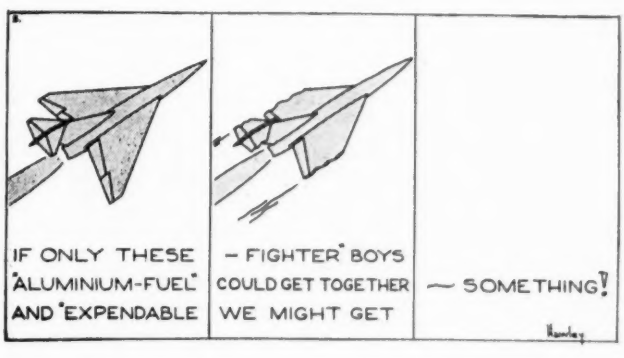
SCIENTIFIC MEETING IN INDIA

THE Commonwealth Advisory Committee on Defence Science is to meet in New Delhi from March 2nd to 14th. The attendance of scientists from Great Britain, Canada, Australia, India, Pakistan and South Africa has already been announced, and Service specialists will also be present. The British delegation will be led by Sir John Cockcroft, chairman of the Defence Research Policy Committee and head of the A.E.R.E. at Harwell.

The talks are the first of their kind to be held outside Britain, under the new scheme whereby each participating country acts as host in turn; the last conference was at Cambridge in July, 1950. Topics likely to be considered include lessons learned from the recent atomic explosion in the Monte Bello Islands, methods of defence against bacteriological and chemical warfare, guided-missile progress at Woomera, and anti-submarine techniques.

Delegates are also to visit research establishments. It is possible that India will make important contributions to atomic-energy development, for the country has large deposits of thorium and there is also some uranium. (Thorium is the third of the world's fissionable elements; plutonium—which has to be made artificially from uranium in a pile—is the other.)

According to the Ministry of Defence, the object of the talks will be to "promote scientific research relating to defence in all fields by closer collaboration within the Commonwealth.



AIR-SEA VICTORY

THE sequence of greatest aeronautical interest in *Sea and Sand*, Episode 13 of the B.B.C. Television film *Victory at Sea*, was undoubtedly that of an impressive fleet of Ju52s used by the Germans to build up their forces in Tunisia after the Allied landings in North Africa. These landings resulted in the first major victory for the Allies which, in the words of the commentator, "if it was not the beginning of the end of the war, was at least the end of the beginning."

Other shots of aircraft included Lightnings being towed through streets, the unloading of Kittyhawks from a ship, and a Dauntless laying a smoke screen in front of Allied landing craft. There were also a few brief glimpses of a Hurricane IID shooting-up Axis tanks.

Episode 13 marked the half-way mark of the complete series and it is significant that, although the film is dealing primarily with the Allied victory at *sea*, of the 6½ hours so far screened, over 1½ hours have been devoted entirely to air-power and to impressions of aircraft in action.

Episode 14 encompassed the conquest of Sicily and the invasion of Italy up to the fall of Rome on June 5th, 1944. The war's biggest convoy, totalling 3,000 ships, and landing craft carrying 160,000 men, took part in the initial landings. An omission from the film was the spectacular parachute drops made during the invasion of Sicily—during which, we believe, there were some instances of faulty aircraft recognition by naval gunners, with disastrous results.

The landing at Salerno was covered and dramatic shots shown of some of the bitter fighting that took place. Remarkably big echelons of Ju87s were shown dive-bombing Allied transports and the warships were seen giving artillery support to the hard-pressed British troops. According to the sound-track commentary it was during this action that the Germans used their new "remotely controlled glider bomb" for the first time, apparently with considerable success. As the Henschel Hs293 glide bomb had been in operational use since the summer of 1942, this was presumably meant to refer to the radio-controlled "Fritz X-1" armour-piercing bomb, which soon afterwards sank the *Roma*, the largest Italian battleship, after her surrender to the Allies.

Also shown was the landing of 50,000 Allied troops behind the German lines at Anzio. B-24 Liberators and Fortresses were shown in action, bombing and fighting off attacks by Me109s. Some unusual shots of German Heavy A.A. guns firing almost vertically were also seen.

PROBLEMS OF PRODUCTION

A Sub-contractor Comments on the Views Expressed at a Recent Conference

By A. M. AITKEN, B.Sc., A.F.R.Ae.S.

IT is a physical fact that the rim of a wheel travels faster than the hub. The papers presented at the recent conference organized by the Institute of Production Engineers were, by virtue of the posts held by the authors, expressing the views of certain sections in the industry as seen from the hub looking towards the rim. It is said that the onlooker sees most of the game, and the comments expressed here are based on knowledge gained in viewing the industry as a whole from the office of one of the many sub-contractors engaged in tooling for aircraft. This, it may be said, is looking from the rim towards the hub.

To point out the need for efficiently planned, rapidly completed tooling would seem to be superfluous, although this is as yet by no means an accomplished fact. To quote Mr. Povey: "The normally long period between first prototype flight and first production delivery for any aircraft (one to two years for light aircraft, three to seven years for large types) could be reduced by effective and early decisions on the three main points of financial risk, flight testing and tooling. . . . The question of tooling is a major one, involving many factors."

Mr. Fielding, in his paper, stated: "An early tooling programme should be made out, both for the issuing and manufacturing of tools; and a target established for the necessary sub-contracting." This is where the wheel spins fastest, for often the toolmaker receives an order dated, say, 1952, accompanied by a drawing dated 1951, with a request for three or four weeks' delivery. What happened during the period between the issue of the drawing and the issue of sub-contracting the order? Somewhere valuable time has been lost, and the manufacturer attempts, in some cases, to try to regain that time and maintain his target by cutting down the manufacturing period allowed for a particular tool. In many cases there is a genuine time-lag in design, so that where a planned tool-manufacturing programme has originally allowed 16 weeks, the sub-contractor is allowed only four or five weeks in order to keep to the target.

If the sub-contractor is working solely for one manufacturer this problem can be dealt with in a fairly simple manner, but if, as so often is the case, he has eight, ten, twelve or even more manufacturers on his books the situation rapidly deteriorates into chaos, where, in this age of mass-issued "super-priorities," his own progress department merely becomes a "fag" for the Ministry of Supply. If tool requirements can be made known at an early date as suggested by Mr. Fielding, why not pass on that extract of the programme which vitally affects the toolmaker, informing him of the manufacturer's internal priorities, in order that the sub-contractor may have a clear picture of the situation and so more rapidly evolve his own solutions?

A new problem has arisen with the present situation, where one or more entirely separate firms are making the same product. At the moment, where this situation occurs, two systems of sub-contracting, at least, are in operation. The first of these is that each manufacturer, independent of the parent company, sub-contracts his own tooling. The situation therefore arises whereby the toolmaker has no sooner finished a tool than he finds that he is required to produce an identical tool for another manufacturer, for the same purpose. This could have been produced sooner and more economically had both tools been ordered at the same time. The second system, and one more acceptable to the sub-contractor, is that where all the tooling which has to be sub-contracted is placed by the parent manufacturer with instructions to deliver to the appropriate firm on completion. A separate control department is necessary for the successful operation of this system, but the danger of duplication or omission of tools is greatly diminished. At a time when, to quote Mr. Povey, "the number of tools is increasing with every new design," it would seem that the unnecessary duplication of tools is an almost criminal folly.

Mr. Povey stated: "In jig and tool design much time can be saved by the intelligent co-operation between the designers and the makers; detailed design of the tools can often be performed by the latter." This realization should spread new hope in the breasts of thousands of toolmakers with the interest of the aircraft industry at heart. In the past much time has unnecessarily been lost in the checking and re-designing of impracticable tools. The necessity for further standardization in tool design is becoming more and more urgently required. One firm has done much in this direction, but full use of its services are not yet being made.

THESE pertinent comments on the views expressed at the recent aircraft-production conference of the Institution of Production Engineers are by an executive of a firm of sub-contractors. He emphasizes that the views are personal, and do not necessarily represent those of his employees. The proceedings of the conference were summarized in "Flight" of January 9th.

Indeed, an extension of this system for the use of standard parts in the manufacture of tools may yet be the greatest single contribution to speeding up production of new types. The introduction of many incompletely trained, or inexperienced, design draughtsmen has not helped in this respect. Furthermore, many delays can be obviated by more stringent checking of completed drawings and the immediate withdrawal of "out-of-date" issues. Often the time taken in checking indecipherable drawings and non-dimensioned holes, etc., is equal to the time required for the complete manufacture of the jig or tool. Obviously, where detailing is carried out by the maker, this delay is to all extents and purposes eliminated.

It is often the case that a series of jigs, tools and gauges, necessary for the manufacture of a particular component, is sub-contracted to one toolmaker. The supply of a prototype component or a résumé of the operations necessary for its manufacture together, where permissible, with details of the function of the component, would greatly assist in the manufacture, of the series of required tools. There can be no doubt that Mr. W. C. Puckey hit the nail on the head in his summing-up of the conference and hit particularly hard, with his "second impression of the great need for more and better trained planners, tool engineers" and, whispered or not, "managers."

One after another, the large manufacturers are in the process of increasing their "working capital" to meet the Government's desire to "press forward the production of the newer and more advanced types . . . it is super-priority orders of this kind that will demand heavy tooling up." (*Flight*, December 26th, 1952.)

The cost of the tooling up, largely represented in man hours of effort, is originally met by thousands of small tool firms, often partnerships or small limited companies working with little or no reserve of capital. The collective financial burden of these firms has to be borne for a transitional period of approximately six months. As yet it would appear that there is to be no financial solace for the small toolmaker upon whom rests much of the responsibility for establishing the aircraft industry to a major position from the production aspect.

Ministry of Supply assistance in the provision of machine tools for the production of jigs and tools required by the aircraft industry is not yet what it might be. The present system, whereby the main contractor must himself apply for the provision of these machine tools, is in itself unsatisfactory. It may be that the tools sub-contracted by the manufacturer to a toolmaker are well within the sub-contractor's capacity, but the total capacity required by a toolmaker, who has the "know how" and labour availability, can only be assessed by the toolmaker himself, as he alone is in possession of the full details of the total capacity which he requires to meet several manufacturers' demands. It would follow that a toolmaker's request for Government assistance in the provision of machine tools should be considered on its own merits without requiring the backing of all the toolmaker's customers.

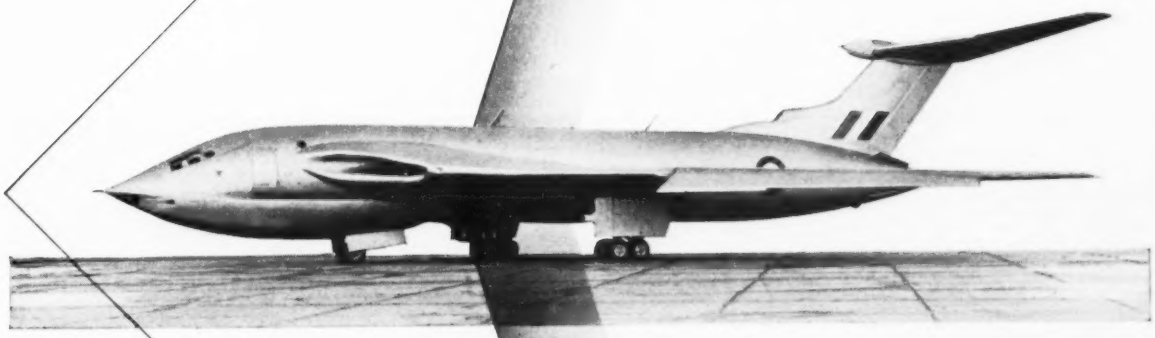
AN 80-FT. D.H. AIRSCREW !

A MOST unconventional de Havilland airscrew is shortly to go into service with B.E.A.; of variable-pitch, two-bladed type and fully feathering, it is of 80ft diameter. In case this news appears of doubtful authenticity, it may be added that B.E.A. in this context stands for British Electricity Authority, and that the 80ft airscrew is, in fact, an experimental power-generating windmill, to be tested this summer on a site near St. Albans. Operating on the "depression" principle originally developed by Andreau in France, the rotor has hollow, open-tipped blades from which the internal air is extracted by centrifugal force as they revolve. This creates suction in the hollow shaft and also in the 100ft tower which carries it; and in this tower is the axial-flow air turbine that drives the 100 kW generator.

Of particular interest are the names of the firms principally concerned in the experiment. The design was by the de Havilland Propellers, Ltd., and the machine was largely constructed by them, while the electrical equipment is by English Electric, Ltd., and Enfield cables are used throughout the installation.

WORLD'S FIRST OPERATIONAL

CRESCENT BOMBER



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NOT WANTED ON VOYAGE

Journalistic Heart-cry from - - - - - -

PATRICIA STROUD

THE AUTHOR—a free-lance journalist—discusses the effects of the I.A.T.A. regulation which prohibits free travel on international air services. In fairness to I.A.T.A., it should be recorded that the regulations which it enforces are formed by unanimous agreement of the member-airlines. American pressure was largely responsible for the agreement in this particular case, since abuse of free-travel concessions seems to have been most widespread in the United States. The purpose of the regulation was to prevent an airline (particularly a large and wealthy company) from gaining unfair advantages by wholesale dispensation of free tickets—not merely to journalists but to travel agents, politicians and so forth. The airlines are agreed on the need for some measure of control, but, as Mrs. Stroud points out (and many airlines, we know, agree), the present restrictions are detrimental to the interests of both the operators and the public.

FOR some time now it has been becoming more and more difficult for aviation writers to give their readers first-hand, personal impressions of the routes, aircraft and services of the airlines. Certain prohibitions continue to be enforced by the International Air Transport Association in order to achieve conformity with the somewhat pedantic requirements of United States legislation whereby those of its members who provide journalists with free travel facilities on international routes are liable to substantial penalties.

Thus, since few of us free-lance writers earn sufficient from our labours to cover the cost of the necessary air fare, we can only pass on to our readers the facts which are fed to us from the press departments of the airlines themselves. Such titbits enable us to inform you that there are at least half a dozen airlines which claim to have operated the first air service in the world and countless numbers which offer their passengers the most comfortable reclining chairs, the smartest sky-lounges, the sweetest stewardesses, the quietest cabins and the airiest omelettes west of Suez.

These superlatives are very satisfactory for air transport as a whole but we consider that we should have the opportunity of testing the validity of such claims. One must have tasted a bad omelette to appreciate a good one.

We are neither begging the airlines partly to finance our honeymoons abroad nor to endorse our Parisian perambulations; we merely ask that the American authorities and I.A.T.A. should recognize that we like to know what we are writing about in order to do so worthily—for the airlines' eventual profit as well as our own.

The reader must not assume that there are *no* loopholes through which the determined writer can fight his way; but the hazards are so tough, and the resultant burden so obvious to our fellow-journalists, that, unless the trip of a lifetime presents itself we hesitate to take the chance.

The arrangements for such an excursion incur all the cloak-and-dagger methods of a resistance movement. The initial encounter must take place at midnight, as far away from the airline office as possible, otherwise a witness' report of our daylight visit, plus subsequent proof in the form of a couple of articles on "A Day in the Life of an Arabian Air-hostess," might add up to a $4,000 fine for the airline concerned.

Other methods are less furtive : for instance, in the case of one airline all one has to do is to ——— — —— – – ——* and in another ——— — —— ——— – – ——*; but, of course, on one's return with an inexplicable tan or a severely frostbitten nose one must not tell a soul in whose sunshine one has basked or upon what Arctic wastes one has wandered; and at least ten years should elapse before any explanatory article on the subject is published.

These restrictive regulations are enforced by officers who, like a modern Flying Dutchman, roam the air lanes of the world searching for they know not whom.

One can imagine that, in such an undercover war as this, each airline has in its sanctum a well-beflagged map showing the whereabouts of every aerial catchpoll; that on the convergence of a host of flags on, say, the Eastern Mediterranean, a pincer movement will immediately be initiated to prise that well-known journalist Charles Knuckleduster from the airport restaurant at Istambul and set him safely down at Santa Maria.

It must be understood that I.A.T.A. does admit us *some* prerogatives. It permits us to fly on aircraft of a new type when it is about to go into service with an airline—so it is to be hoped that the installation of turbine power in such aircraft as Convairliners and DC-6Bs will transform them into new aeroplanes so that we may sample them. If this change in propulsion is regarded by I.A.T.A. as merely a modification, then we regret that again we will only be able to tell you how wonderful their manufacturers and operators say they are.

We are also allowed to fly on a proving flight over a new route; but this again is a dubious concession, since there are few of these still to be opened up—even the North Pole is shrouded in military security. So until Alaska Airlines brings Mount McKinley a little closer to Maida Vale, and the Britannia rules the skies, theoretically we are grounded.

We are left with few alternatives. Those of us who are old enough can describe the wonders of the old H.P.42s on which one could wine and dine with all the appropriate accoutrements —silver, damask and flowers on the tables; or we can slip through the clutches of I.A.T.A. and examine and proclaim the virtues and vices of the few airlines still small enough to choose freedom rather then security.

**Censored !*

OERLIKON DEVELOPMENTS

THE name of Oerlikon is familiar to all who are interested in armament, but the situation of the factory is, perhaps, less widely known. The firm is, in fact, Swiss—the Oerlikon Machine Tool Works, Buhrle and Co.—and its armament factory is at Oerlikon, on the outskirts of Zurich. For many years past a great variety of high-quality arms and ammunition has been manufactured in this plant. Some information on the range of products now being offered has recently become available, and we are indebted to *Aviation Age*, New York, for much of the material that follows.

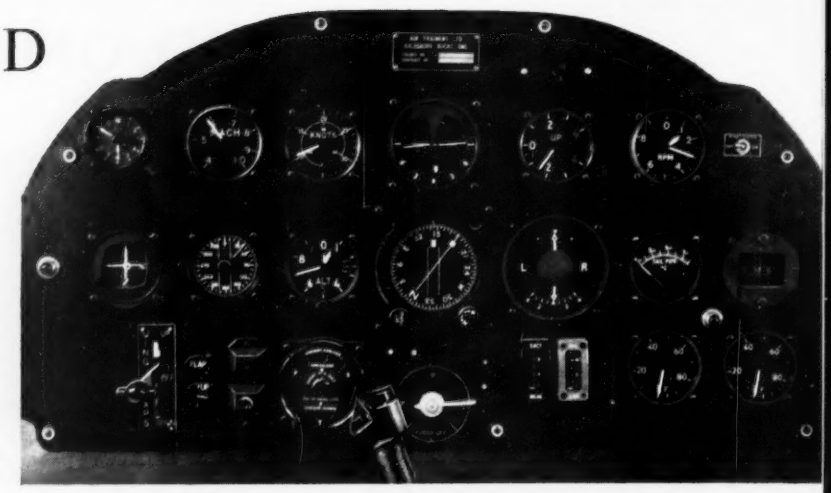
No attempt is being made to design aircraft guns of over 30 mm calibre, as it is held that rocket projectiles are more efficient in every way, being smaller, lighter, more destructive, recoilless and —most important—capable of being guided, and therefore acceptably economical in spite of their high cost per missile. Also, the low rate of fire of a large-calibre gun renders it less suitable for modern high-speed combat, even though the projectiles may be fitted with proximity fuses.

Gun production at Oerlikon is now turning over to 20 and 30 mm airborne weapons with cyclic feed. In these guns, rounds from a belt are fed, in two stages, into a five-chamber revolving cylinder, and are fired electrically when correctly positioned behind the barrel. This system, based on that devised by the German Mauser Company, gives the astonishing figures of 1,600-1,800 rounds per minute for the 20 mm gun and 1,200 r.p.m. for the 30 mm—each with a muzzle-velocity of approximately 3,600 ft/sec. This compares with the figures of 600 r.p.m. and roughly 3,000 ft/sec of the familiar wartime guns. A variety of self-destroying ammunition is made for each calibre.

As for rockets, there is a range of solid propellant missiles suitable for both air and ground use—a useful attribute from the point of view of military logistics. Impact fuses are employed, but a safety device prevents detonation of the warhead should the rocket strike anything before it has travelled a certain minimum distance—usually about 100 yards. A radar proximity-fuse is under development : in the event of a miss, the fuse detonates immediately the point of closest approach to the target has been passed.

Up-to-date information is naturally lacking on guided missiles but it is known that the first Oerlikon units are 16.4ft in length and weigh 550 lb: warhead plus proximity fuse together account for 44 lb of this total. Four stabilizing-vanes are fitted, and propulsion is by "hot" rocket, the oxidant being nitric acid, presumably in combination with some liquid hydrocarbon. The projectiles are designed as ground-to-air weapons, will reach an altitude of 66,000ft and attain a maximum speed of 2,460ft/sec (roughly 1,680 m.p.h.). At present the target is sighted and the rocket guided on to it by a specially developed ground radar set which provides sight- and guide-beams; but this method is now obsolete, and others are under development. Little is known of Oerlikon air-to-air guided missiles, although such weapons are believed to be in preparation.

HIGH-SPEED LINK



The instrument panel of the new trainer is seen to be quite comprehensive. Arrangement is typical of that in a jet fighter, though not a replica of any particular one.

INSTRUMENT flying in jet aircraft is a tricky business, for added to the basic difficulties of the art are the effects of high Mach number, air-brakes, immensely rapid climb, and controlled rates of descent up to 10,000ft/min. In particular, altitude can vary alarmingly with very small changes in longitudinal trim, owing to the high speeds involved.

The D.4 Link Trainer, manufactured at Aylesbury by Air Trainers, Ltd., and now in large-scale service with the R.A.F., has already gone some way towards meeting modern training requirements, but now comes news that, next month, delivery will begin of a "600-m.p.h. jet version"—the A.T.50. It is claimed that with the aid of this new equipment a jet pilot can be properly trained in instrument flying in about half the time which the process would take in the air, and at considerably reduced cost and risk. Also, training can continue during non-flying weather.

The cockpit of the new Link has a clouded Perspex hood, harness is provided for the pilot, and the "feel" of controls at different speeds is ingeniously transmitted to stick and rudder pedals. Flap and air-brake controls are installed which produce typical responses in the flight instruments. Rates of roll and pitch are as high as in the real thing, and even a formidable buffet has been introduced, warning the pilot when he is approaching critical Mach number. A value of 0.76 is normally set for this limiting figure, but it can be increased if desired. Machmeter readings change with altitude as in normal flight.

Maximum speeds simulated in the trainer are 520 kt at sea level, and 250 kt indicated at 40,000ft. Service ceiling is 42,000ft, which can be reached in nine minutes at 14,500 r.p.m. During such a climb, A.S.I. readings change from 360 to 182 kt, and Mach numbers from 0.54 to 0.63. Performance is, therefore, seen to be somewhat similar to that of the Meteor 8, although the A.T.50 is "single-engined."

Oil pressure and tail-pipe temperature vary realistically with engine speed. Radio equipment is complete, and comprises—as on the D.4—R/T., I.L.S., S.B.A., radio range and radio compass. Winds of up to 90 kt can be applied to the recorder.

Constructionally, the new trainer has been designed to differ as little as possible from its predecessor: change-over of production has, therefore, been eased and cost kept to a minimum, especially in comparison with that of proposed electronic trainers. Furthermore, D.4s can readily be converted, and spare part and maintenance problems will, it is stated, differ little from those of yesterday.

CLASSICS OF REFERENCE

"Jane's All the World's Aircraft, 1952-53." Compiled and Edited by Leonard Bridgman. Sampson Low, Marston and Co., Ltd., 25 Gilbert Street, London, W.1. Illustrated. Price £4 4s.

FOR 43 years, "Jane's" has been the standard reference book of world aviation. It is no mere catalogue of aeroplanes; one could learn from its large shiny pages such things as the altitude of an obscure airport in Turkey, the names and addresses of Russian air journals, equipment of the Guatemalan Air Force, and location of the headquarters of R.A.F. Groups.

In many cases, such data has not been readily available elsewhere: so one can only share the regret of the publishers that most of it has had to be left out of the 1952-53 edition.

Since Sections A and B, covering Military and Civil Aviation respectively, were introduced into *All the World's Aircraft* shortly after the 1914-1918 War, aviation has expanded to such a degree that this year the Editor had the clear choice of letting the book grow to impractical size and cost, or reducing the length of Sections A and B. The only other alternative, of cutting the descriptions and illustrations of all the world's aircraft and engines was, of course, unthinkable. So the present decision was inevitable; and in place of the old Sections A and B, which filled 80 pages last year, the new "Jane's" has three and a half pages of national markings of the air forces of the world, one page of international civil-aircraft markings, three pages on I.C.A.O., I.A.T.A., and the F.A.I., a page of international aviation records and 16 pages of extremely useful data on the world's airlines.

The main parts of the 1952-53 volume are as comprehensive, accurate and valuable as ever. Part C, covering "All the World's Aeroplanes," contains 573 illustrations, of which 311 are new, including interesting photographs of a Sabre with Flight Refuelling probes in the noses of its drop tanks, the XA2J-1 Savage with wings and tail folded and an RF-84F complete with wing fences. Ten additional illustrations of the latest British aircraft shown at Farnborough appear in an addenda. Details of Soviet aircraft are wisely restricted to those types of which details have been reliably confirmed; but nine other types are referred to in note form, including fighters, bombers, two flying-boats and a big single-engined biplane transport, of which a photograph is included.

Part D this year totals 60 pages, of which 26 are devoted to gas turbines and 34 to piston-engines. And there are seven illustrations of airships in Section E, which contains a photograph of the U.S. Navy's big new Goodyear N-1 blimp and first details of a proposed German W.L.1 airship. Finally, a feature which should prove popular is inclusion—in both the general aircraft index and the helicopter index—of references to aircraft described in the six preceding editions of "Jane's," many of which are still in service.

"Brassey's Annual—the Armed Forces Year-Book 1952." Edited by Rear-Admiral H. G. Thursfield. William Clowes and Sons, Little New Street, London E.C.4. Illustrated. Price £3 3s.

IF, like your reviewer, you looked forward each year to publication of the old *Brassey's Naval Annual* with its fascinating side elevations of the world's warships, it is still easy to view its three-year-old successor with rather jaundiced eyes. Who, one wonders, will pay three guineas for a yearbook containing the sort of articles they can read throughout the year in the *R.U.S.I. Journal* or the *Royal Air Force Quarterly*?

Only when one takes the trouble to delve more deeply into the new "Brassey's" does its real value become apparent. Through its 430 pages, the serving officer, or ranker, in any of the three Services, can learn something of the work, the problems and the achievements of his colleagues in the other two. More important, he can begin to see how the defence forces of his own country are being shaped to dovetail into a worldwide pattern.

The 31 articles in this year's "Brassey's" cover an incredibly wide field, from "The Making of an Officer" to "War by Proxy," "Atomic and Political Warfare," "The Future of the Aircraft Carrier," "The New Home Guard," "The Future Influence of Air Power," and "Foreign Air Forces"—an increasingly valuable chapter in view of the deletion of such information from "Jane's" this year. Most are written by acknowledged experts, and although there are some strange omissions in the chapter on "Aircraft Development," it is useful to be reminded that Blackburn and General Aircraft have been considering a "transformable delta," in which "for take-off and landing part of the leading edge of the delta wing swings out and forward to provide a wing, with conventional aileron, at right angles to the hull," as described and illustrated in an article in *Flight* of July 27th, 1951.

The aeroplane

The Blackburn " Universal " Freighter. This versatile, box-like aircraft carries charabancs, tractors, Army Tanks, even mechanical excavators up to 22 short tons. Span : 162', length : 99' 2". Four Bristol Centaurus 171 engines.

the pilot

Flight-Lieutenant Harold ("Tim") Wood has been with Blackburn and General Aircraft for eleven years. Has been flying since 1925. Before the war he had an adventurous time flying to Australia in a Monospar, with a forced landing on a barren coral reef in the Timor Sea. Chief pilot of British-American Air Services until 1939, then R.A.F. until 1941. Says "Shell and BP Aviation Service has kept me airborne all these years."

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CRC239

CIVIL AVIATION

AIRWORTHINESS TALKS CONCLUDED

AMERICA is not yet willing to accept British Certificates of Airworthiness for turbine-powered aircraft; recent talks on the subject between the British A.R.B. and the American C.A.A. resulted only in the statement—made in Washington on Monday—that "there do not appear to be any insurmountable obstacles to eventual agreements on certification standards . . ." The American authorities also re-iterated their willingness to consider British machines on an *ad hoc* basis. At the time of going to press, the full text of the C.A.A. statement was not available in this country; it appears, however, that while no important concessions have been won by the A.R.B. mission, the prospects of prompt certification for the Comet 3 have definitely been improved. A closer understanding will presumably result from the C.A.A.'s return visit to this country in the autumn.

I.A.T.A. TECHNICAL CONFERENCE

SAN JUAN, Puerto Rico, will be the venue of the sixth I.A.T.A. Technical Conference, which is to be held from April 20th to May 2nd, with the American member-airlines as hosts. Some of the world's leading authorities on helicopter operations, including Mr. Igor Sikorsky, Mr. Frank Piasecki, Mr. Peter Masefield and Capt. A. Vernieuwe (Sabena), will take part in the helicopter symposium which will be the principal feature of the conference. The two other main discussions will be centred on (*a*) problems of air navigation and traffic control in terminal areas with overcrowded air space and (*b*) the degree of operating efficiency which can be expected in future transport aircraft. Altogether some 200 people will take part in the conference, which will take into account the views not only of airlines but of manufacturers, national and international bodies and research groups in aeronautics.

U.A.T.'s COMET PROGRAMME

IN mid-February, only two months after the delivery of the first of their two Series IA Comets, Union Aéromaritime de Transport intend to begin regular Comet services on the Paris-Casablanca-Dakar route. Towards the end of the month a number of flights will be made on the Paris-Brazaville route (*via* Tripoli and Kano), and a regular passenger service should be in operation by the second half of March. Dakar services will be operated twice weekly and the journey from Paris will take about nine hours. The first jet airliner for U.A.T., registered F-BGSA, was delivered to Paris by a French crew on December 17th; delivery of the second is expected shortly.

TWO HUNTING SURVEYS

ON behalf of the Sudan Government, Hunting Aerosurveys recently undertook a 4,000 sq mile photographic survey. Photographs and mosaics are now in the hands of the ecologists employed by Sir Alexander Gibb and Partners, who are responsible for submitting a report to the Sudan Government on the irrigable possibilities of areas adjacent to the White and Blue Nile. The survey was extended to cover the proposed reservoir at Roseires on the Blue Nile. Contoured maps will be prepared of this area to determine the capacity of the reservoir.

Hunting's flying manager, Capt. John Saffery, D.S.O., is in charge of a crew operating a Percival Prince Survey aircraft owned by the Thailand Government. Several other company technicians are helping to train Thai personnel in aerial mapping methods and, at the same time, assist in carrying out projects sponsored by the International Bank for Reconstruction and Development.

MASEFIELD TRANSPORT LECTURE

REPLACING at extremely short notice Sir Frederick Handley Page, who because of influenza was unable to deliver his Brancker Memorial Lecture, Mr. Peter Masefield, B.E.A.'s chief executive, gave "Some Thoughts on the Future Prospects of British Air Transport" before the Institute of Transport on Monday last. In his talk Mr. Masefield considered in turn the growth of air traffic, British aircraft export potentialities, economic factors relevant to the fares structure, and the position of the helicopter. We hope to print a fuller account in next week's issue.

LIBYAN AIRWAYS INAUGURATED

CARRYING a payload consisting of one car, several passengers and over a ton of mail, the first Bristol Freighter of Libyan Airways inaugurated regular services between Tripoli and Benghazi on February 1st. Demonstration flights were given at both terminals to members of the Libyan Government and local merchants. The inauguration was attended by Mr. Eoin Mekie and A. Cdre Griffith Powell, chairman and managing director, respectively, of Silver City Airways, parent company of the new Libyan operator, which has been formed under a concession granted by the Libyan Government (*Flight* of January 2nd). On his return, A. Cdre. Powell said that he was agreeably surprised by the demand for passenger space. He believes that seating accommodation in the Freighters will ultimately have to be increased.

VISCOUNTS FOR FRANCE

SIX of the twelve Vickers Viscount 708s ordered by Air France are now taking shape on the assembly line at Weybridge, and the first machine is expected to be flying in a matter of days. This aircraft bears the registration F-BGNK; the other five will be F-BGNL to Z. Air France deliveries are to be made parallel to B.E.A.'s (the Corporation's fourth Discovery-class Viscount is now very nearly completed) and the second batch of six will soon begin construction. The aircraft differ only in internal layout and colour scheme; the Air France interior is silver-grey and blue in contrast to B.E.A.'s grey and red, and the kitchen is located in the rear fuselage instead of in the section between the passenger cabin and flight deck, as in the 701.

THE NEW JOHANNESBURG AIRPORT

AS illustrated in the previous issue of *Flight*, Johannesburg's new Jan Smuts Airport is now taking shape; the terminal block and control tower are practically finished, and a South African correspondent reports that the airport should be in commission by June. For some time, he adds, the airfield has been used as a take-off base for Comets and occasional Pan American aircraft. The passengers come from Palmietfontein in "sealed" buses as there are no Customs' facilities at Jan Smuts. Now the headquarters of South African Airways will be moved there from Germiston. Two of the biggest hangars at Palmiefontein have been dismantled and put up again at Jan Smuts. The main runway of the new airport is 10,500ft long.

CENTRAL AFRICAN BUDGET PROBLEM

"ECONOMIES wherever possible" are being introduced by Central African Airways in an effort to keep within their budget for the second half of the current financial year. The year's subsidy is £120,000, compared with £160,000 for the previous twelve months, and the allowance was exceeded by £25,000 during the first six-month period. A Corporation executive said recently that bookings were not being accepted for services where the demand did not justify their being run, but that these services were still available if people wanted them. Engineers employed by C.A.A. had volunteered to work an extra hour a week at normal rates of pay instead of at overtime rates, and employees in most other departments had volunteered to work the extra hour without any extra pay at all. As a result of these economies and of careful planning, the Corporation was actually £35,000 under its planned expenditure for the first six months of the year. He added, however, that increases in revenue were not large enough to justify the additional services which the Corporation were trying to provide.

PALMIETFONTEIN is at present the main airport for Johannesburg, although, as reported above, the new Jan Smuts Airport is already in limited use. Shown arriving at the former is S.A.S. DC-6 "Skjold Viking," which recently opened a regular service from Stockholm.

ONE OF 16 AIRLINES to have ordered the Convair-Liner 340 (the subject of the discussion below) is Braniff International Airways, which operates U.S. domestic and South American routes. Pictured here is the first of 20 Convair 340s on order by Braniff.

CIVIL AVIATION . . .

THOUGHTS ON THE CONVAIR-LINER

ONE reason for the belief that few, if any, orders have been lost to the British civil aircraft industry by reason of long delivery-dates may well be that a great part of the market has already been captured by American competitors. Many of our potential customers have quite recently placed orders for American transport aircraft which must be fully utilized for anything between five and ten years before their owners can think of replacing them with turbine-powered types. In the long- and medium-range categories most of the successful American machines are of wartime or immediate post-war design, and the latest orders are for those versions developed to give better performance and payload capacity.

A good example of these successful American designs is the Convair-Liner series for short and medium stage-lengths. The prototype Model 240 first flew in March 1947 and was certificated for civil aviation only eight months later. Altogether 175 Convair 240s were built—170 for the airlines. A larger, more powerful version, the Model 340, made its initial flight in October 1951 and received its C.A.A. certification in March 1952. Latest available figures show that the 340 has proved as attractive to operators as its predecessor, for over 20 orders have subsequently been placed for a total of at least 175 aircraft. Several have already been delivered and are in service with domestic operators.

Assuming a unit value of £200,000 per aircraft (and this is considerably less than the figure at present quoted for the 340), these combined orders for 350 Convair-Liners are worth £70 million—or some £35 million more than the total value of Britain's aircraft exports in 1952. About three-quarters of Convair's civil output is for domestic operators, the total export value of Model 240s delivered or 340s on order being in the region of £18 million. Details of Convair orders and the 32 operators responsible (including 26 airlines) are as follows (excluding military contracts):—

	Model 240	Model 340
Airlines		
American ...	79	
Braniff		20
Chicago and Southern ...		10
Continental ...	5	7
Delta		10
Hawaiian ...		6
Mid-Continent...	5	6
National ...		14
Northeast ...	5	4
P.A.W.A. ...	15	
United		55
Western ...	10	
Aero Argentina ...	5	
Aero O/Y (Finland)		3
Aeronaves de Mexico ...		3
Central Air Transport ...	6	
Avensa (Venezuela) ...		3
C/fd.	130	141

	Model 240	Model 340
B/fd.	130	141
Cia. Mexicana de Aviacion ...		8
Ethiopian ...	2	
Garuda Indonesian	8	8
K.L.M.	12	6
Orient	3	
Philippine ...		6
Sabena	6	
Swissair... ...	4	
T.A.A.	5	
Corporations		
Aramco... ...		2
Executive Convair-Liners ...	4	
Allison Div., G.M.C.* ...	1	
Mexico		2
Texas Co. ...		1
Pratt & Whitney		1
	175	175

*Turboliner.

It will be seen that only five of the orders for 340s follow up previous purchase of 240s. The largest number of 340s will be operated by United Air Lines, with 55 aircraft; five of these were originally ordered by Pioneer Air Lines. Large numbers of the T-29 crew-trainer version of the 340 have been delivered to, or are on order for, the U.S.A.F., and an additional order for turboprop variant (employing Allison T-38 turboprops and designated T-29E) was placed in October 1951. Yet another military version ordered in large numbers is the C-131 casualty-evacuation transport.

The Convair 240 is normally equipped to carry 40 passengers plus baggage. By comparison, the Model 340 has a longer fuselage providing standard accommodation for 44 passengers or additional freight; it also has higher aspect-ratio wings of increased span to permit the carriage of 500 gallons extra fuel (the 340's two integral fuel tanks give a total capacity of 1,750 U.S. gallons). Numerous other refinements have been embodied. Basic comparative data for the two aircraft are as follows: *Convair* 240: length, 74ft 8in; span, 91ft 9in; wing area, 817 sq ft; weight empty, 30,345 lb; take-off weight, 41,790 lb. *Convair* 340: length, 79ft 2in; span, 105ft 8in; wing area, 920 sq ft; weight empty, 32,399 lb; take-off weight, 47,000 lb. Both types are pressurized and are powered by the same basic engine—the Pratt and Whitney R-2800; but the Model 340 has two CB16 engines which give a higher normal cruising power than the CA18s powering the earlier machine. For short ranges the manufacturers quote maximum payloads of 10,155 lb (Model 240) and 14,100 lb (Model 340).

One disadvantage common to both aircraft is that the relatively narrow internal cabin-width of 8ft 10in makes five-abreast seating an impossibility. In the 340, higher-density seating can only be achieved by installing extra pairs of seats in the fore or aft portions of the cabin and by decreasing the seat-pitching, in stages, from the normal 38in down to 34in. In this way, seating capacity can be varied between 44 and 56.

According to the maker's figures, the Convair 340 can carry 13,500 lb payload over a 200-mile stage-length at a block speed of 210 m.p.h., assuming that 1,100 b.h.p. are being drawn from each engine at a cruising height of 10,000ft in still air; under the same conditions a payload of 10,000 lb can be carried by the 340 on a 1,000-mile stage at a block speed of 240 m.p.h.

Convair's estimate of operating costs under U.S. domestic conditions shows a direct hourly cost of $138 and a corresponding figure of 67 cents per statute mile. These values assume a fairly high average utilization of eight hours daily, average journey length of 200 miles and speed of 207 m.p.h., with seven-year depreciation of capital investment. Corresponding figures for operating the CV-340 outside the United States show increases of some $60 per hour and 25 cents per mile, primary reasons for the increase being high fuel costs and lower utilization. In any case, such figures are probably optimistic and would vary greatly under different operating circumstances.

The price of a Convair 340 with spares, according to the latest available estimate, is $700,000 (£250,000), making it more expensive than the Viscount—which, as recent events have shown, is now capable of competing with the Convair on better than equal terms. In performance, structure weight and dimensions, the specifications of the two aircraft are remarkably close, but the British machine, being four-engined, is basically more costly to build in terms of man-hours and materials.

Only high U.S. labour costs can be responsible for the un-

doubtedly steep price of the Convair, bearing in mind the fact that the American company's design, jigging and tooling costs are spread over an output of over 600 basically similar aircraft, compared with (so far) 75 in the case of the British machine. Vickers-Armstrongs claim superiority for the Viscount on the scores of speed, operating cost and load-carrying ability over almost the entire medium-range band. In addition, the four-turbine-engined airliner is claimed to have more passenger-appeal from the aspects of comfort, performance and security. Events support a belief that the Convair sales-curve is well past its peak, and confidence that present and future versions of the Viscount will achieve at least comparable success on the world's short- and medium-range air routes.

FUTURE OF RINGWAY

IN a recent written reply, the Minister of Civil Aviation said that the Government have decided against taking over Ringway Airport which is owned by Manchester Corporation. Having been offered the free transfer of some of the State assets on the airport, and an assurance that the M.C.A. should continue to provide technical and navigational services and pay part of the cost of future development, the city corporation are now considering whether they will retain ownership of Ringway and assume responsibility for its operation.

AMERICAN JET PROJECTS

ACCORDING to the *Wall Street Journal* the Douglas jet airliner, tentatively known as the DC-8, "may appear on the market before competing planes from Boeing or Lockheed." The same source says that the Douglas specification is for an aircraft seating "upwards of 100," with a cruising speed of 550 m.p.h. and maximum range of 2,500 miles. This machine would be 50 m.p.h. slower than the projected Lockheed jet airliner, because Douglas believe that extra speed can only be attained at disproportionate considerable cost. The Boeing plan, according to the Journal, is for a jet airliner capable of cruising at "more than 500 m.p.h.' and carrying 80-120 passengers. As reported earlier, it is hoped that this machine will be ready for delivery to airlines in some 3½ years' time. Boeing hope to interest the U.S.A.F. in a flight-refuelling tanker version of the same aircraft and, if successful, intend shortly to lay down a production line. Lockheed, however, state that they would like orders for 40-50 jet airliners before tooling up for production. This company believes it will receive over the next few years orders for at least 100 aircraft—25 more than the estimated number required to break-even.

MORE SCHEDULED SERVICES APPROVED

APPROVAL of several more applications is announced by the Ministry of Civil Aviation. The latest list—the third issued in recent weeks, is as follows:—

(1) Internal services to and from the Isle of Man, viz.: (*a*) Newcastle-Ronaldsway: B.K.S. Aerocharter, Ltd., for 7 years; (*b*) Ronaldsway-Newcastle: Manx Air Charters, Ltd., for 7 years; (*c*) Ronaldsway-Carlisle: Manx Air Charters, Ltd., for 3 years; (*d*) Ronaldsway-Glasgow (Renfrew): Manx Air Charters, Ltd., for 7 years; (*e*) Glasgow (Renfrew)-Ronaldsway and Prestwick-Ronaldsway: Scottish Aviation, Ltd., for 7 years; (*f*) Liverpool-Ronaldsway: Starways, Ltd., for 3 years; (*g*) Wolverhampton-Ronaldsway: Don Everall (Aviation), Ltd., for 7 years.

(2) Internal services on the routes: (*a*) Haverfordwest-Cardiff, *via* Swansea (with later extension to London, *via* Bristol): Cambrian Air Services, Ltd., for 10 years; (*b*) Birmingham- Newcastle, *via* Leicester East and Nottingham: Don Everall (Aviation), Ltd., for 7 years.

(3) Normal scheduled services to France: (*a*) Bristol-Paris (Le Bourget): Morton Air Services, Ltd., for 7 years; (*b*) Cardiff-Paris (Le Bourget), *via* Southampton on demand: Cambrian Air Services, Ltd., for 10 years; (*c*) Cardiff-Dinard: Cambrian Air Services, Ltd., for 10 years.

(4) Colonial-coach class services for passengers and supplementary freight to be operated by Hunting Air Transport, Ltd., and Airwork, Ltd., for 7 years on the following route: London-Nairobi, *via* Nice, Malta, El Adem or Benina (Huntings only) or Mersa Matruh and Luxor (northbound only), Wadi Halfa, Khartoum, Juba and Entebbe.

(5) A request by B.O.A.C. for permission to include a traffic stop at Rome, until December 31st, 1959, on the route London-Tripoli-Kano-Lagos and/or Accra.

It will be noticed that, in accordance with Government policy, most of the permits-to-operate cover periods of seven or ten years —giving companies the security required to attract capital for new aircraft The prospect of this security is reflected in the wording of the applications to operate scheduled services which airlines are submitting to the A.T.A.C. Against the entry "Type of Aircraft" appear such familiar names as Consul, Rapide, DC-3, Viking and York, but there is frequently a proviso to the effect that newer types—among them Herons, Drovers, Universal Freighters and Britannias—will eventually be introduced if the application is successful. The only application mentioning new American equipment is that submitted by Hunting Air Transport for the transatlantic freight service, the types specified being the DC-6A and Super Constellation. Airwork, Ltd., and B.O.A.C. have also applied for the same route, but the Minister's decision has not yet been announced.

BREVITIES

JUNE 16th is announced as the opening date of the seventh session of the assembly of the International Civil Aviation Organization, which is to be held at Brighton and is expected to last three or four weeks.

* * *

W/C. Bill Lawes, assistant operations manager of International Aeradio, Ltd., has just returned from a tour and survey in the South Pacific area, made at the request of the Government of Fiji and the Western Pacific High Commission. The survey covered both existing radio facilities and future requirements in the Solomon Islands and Fiji. W/C. Lawes also made valuable contacts with civil aviation and radio authorities at various points along his 30,000 mile route, notably in Australia.

* * *

A Japanese civil aviation mission to Europe is reported to have concluded bilateral agreements with the Netherlands, Sweden, Denmark and Norway; it failed, however, to conclude agreements with France and Belgium. The signing of an Anglo-Japanese bilateral agreement was reported in *Flight* of January 2nd.

* * *

On behalf of United Air Lines, the Radio Corporation of America is developing a new cloud warning radar system. Prototype equipment will be delivered early this summer to enable flight testing to be carried out by a U.A.L. aircraft during the period of greatest storm activity. A joint announcement by the two companies gives few technical details of the new installation, stating only that "it is expected to provide patterns on a radar scope that will give a pilot information on the depth as well as the breadth and height of storm fronts."

READY FOR SERVICE: After only ten hours' flying, the new Bristol 170 Mk 32 (Silver City's "Super Freighter") has completed all the tests required for the award of a full Certificate of Airworthiness. "Bill" Pegg, Bristol's chief test pilot, who completed the C. of A. flying within a fortnight of the maiden flight, reports that the extended Mk 32 is "just as easy to handle as a normal Freighter." As seen above the longer nose is compensated for by an increase in fin area.

CIVIL AVIATION . . . .

As an extension to their present Paris-Bombay route, T.W.A. introduced a weekly Constellation service to Colombo, Ceylon, on February 3rd.

* * *

Six of the eight Douglas DC-6Bs on order for Sabena are due for delivery in March and April. They will be used as 73-seaters on the transatlantic, Congo and certain European routes.

* * *

A Qantas Constellation, flown on various stages of the Indian Ocean route by Capts. Howse, Wharton and Bruce, recently completed an operational test of Australian distance-measuring equipment during a scheduled service from South Africa to Sydney. They reported excellent results with the instrument, which accurately recorded distances of up to 194 miles at the greatest altitude of approach (15,000ft). Ninety D.M.E. beacons are scheduled for installation by the Australian department of Civil Aviation at various points on Australian airline routes; seven installations have already been completed, including one on Cocos Island which should be of considerable assistance to Qantas navigators on the long ocean crossing.

* * *

P.A.W.A. claim that they are now operating the world's longest non-stop scheduled air service—on the 3,900 mile Tokyo-Honolulu route. Taking advantage of the 70-80 m.p.h. westerly "jet streams" which blow along this route in the winter months, the company's Stratocruisers average 355 m.p.h. at 23,000ft, completing the journey in 11 hours. Aircraft formerly landed at Wake for refuelling and the flight took seven hours longer.

FROM THE CLUBS

IN a letter commenting on Capt. R. E. Gillman's recent article on private flying (*Flight*, January 9th), Mr. Michael Conry expresses belief that the article "will inspire quite a number of people to think of forming their own air syndicates." As chairman of the Central Flying Group, which has now been operating successfully for three years, Mr. Conry is anxious to pass on his experience in the form of hints to those contemplating the formation of a similar group.

To begin with, he advises against purchase of an ultra-light type of aircraft, which he says, is "desperately limited in its operation and capacity and in many cases is far more difficult to fly than ex-R.A.F. surplus trainers." It would be foolhardy, says Mr. Conry, to imagine that flying could be obtained for as little as £1 per hour—"even now we, who paid £25 for our Tiger Moth, find that with the petrol rebate plough-back, we just break even at 32s 6d per hour." In support of his belief that the ex-R.A.F. trainer is the ideal aircraft for group flying, he observes that it is reliable and strong, being built to R.A.F. specification, fully aerobatic and not too simple to fly.

The following points are, in Mr. Conry's opinion, essential to the successful formation and operation of a flying group :—

(1) Form a small (and I mean very small, say, three) flying committee, headed by the chief flying instructor.

(2) The C.F.I.'s word to be absolute law (no exceptions to this rule should be tolerated).

(3) An annual weekly subscription of, say, 2s 6d-5s 6d, depending on the amount of weekly revenue required to pay rates and taxes.

(4) Elect a duty crew (pilot and student pilot) whose duties are to see that certain operational requirements are met : e.g., petrol in the tank, oil levels correct, tyres pumped up, fire extinguishers and chocks in positions, etc. (These two people are the backbone of the operating side of the group and they must, naturally, be prepared to give a great deal of their time and attention to the aircraft in the field.) Whereas they are not necessarily required to perform every task personally, it is their responsibility to see that the work is done. However, it is their duty to keep complete and accurate flying records, and communicate all control and pertinent instructions to the pilot and/or C.F.I.

(5) The duty crew will supervise ground-handling of the aircraft, assist pilot and student into straps and parachutes, and generally be responsible for all that occurs on the ground during flying periods. Note : The duty crew naturally are first in line for "buckshee" flying such as air-testing.

(6) Lectures are on the must list, and at least two hours per week should be devoted to pre-flight (and post-flight) instruction. Members of the group who have their P.P.L.s can be divided into classes for Morse, R/T. procedure, advanced weather, aerobatic and night flying instruction.

(7) On-the-spot payment for flying is advisable, to avoid bad debts and bad feeling.

(8) The flying committee should be given power for immediate suspension or expulsion for any violation of discipline. No group worth its salt will survive unless it is prepared to maintain a severe standard of ground and air discipline.

SEVERAL clubs have recently reported far more activity than is normally expected at this time of year. An example is the Christchurch Aero Club, whose members flew 90 hours in November, 120 in December and 140 in January. The club is fortunate in having the support of two of the 12 companies participating in the flying-clubs scheme, by which employees' flying time is subsidized. At present the fleet consists of three Austers, two Tiger Moths and a Proctor, soon to be joined by two Miles Hawks now undergoing overhaul. The club is run by Mr. T. H. Marshall, who reopened it in June last year, and Mr. J. Pothecary is the recently appointed chief flying instructor.

LATEST BONANZA

THE Beech Aircraft Corporation's all-metal Bonanza is perhaps the most successful of post-war four-seat single-engine types; it is claimed that no fewer than 3,400 have been manufactured. The first batch of the latest model, the D35, were due for collection from Wichita on January 31st. Approximately 85 firm orders for this new version have already been placed, for delivery by the spring, and rate of production is one a day in spite of the Corporation's large military commitments. Price is $18,990 ex-works.

The scale on which American business has taken to private air transport was emphasized by Jack Gatz, Beechcraft's vice-president and general manager, at the "unveiling" of the first D35. He pointed out that the total air transport fleet now in operation with commercial enterprises numbered approximately 10,000 machines.

The latest Bonanza is basically similar to its well-tried predecessors, but it possesses a variety of new features. From the pilot's angle, fluorescent lighting is provided, and flap and undercarriage selectors are easily distinguishable by feel owing to their shapes. Normal radio equipment is the Lear LTA-6, but Narco VTR-1D can be fitted at slightly increased cost. Front seats are now adjustable, with special head-rests available if required, and Beechcraft safety harnesses are fitted to every position. Ventilation and noise-level have been improved, there is a map pocket of increased size, and interior upholstery is exclusively of leather. A large range of colour schemes is available, and useful load has been raised by 22 lb to 1,075—of which 822 represent passengers and their luggage.

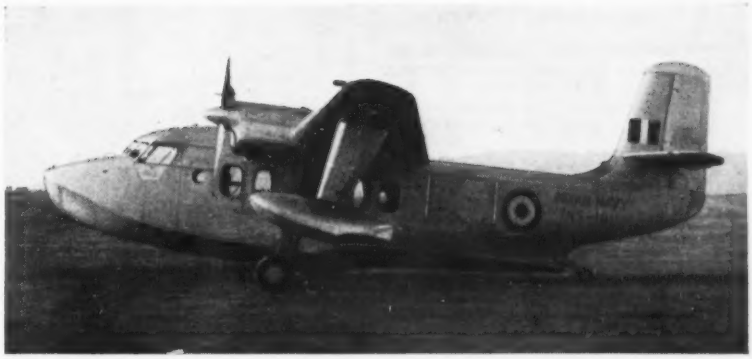
Performance figures remain substantially as before, viz., maximum speed 190 m.p.h., high cruising speed 175 m.p.h., and economical cruising speed 120 m.p.h. Range is 775 miles (or 1,180 miles with 20 gallons auxiliary fuel), and optimum fuel consumption is as low as 19.9 m.p.g. The tricycle undercarriage facilitates safe handling, and take-off and landing runs are 525ft and 227ft respectively into a 10 m.p.h. wind.

In view of the all-embracing nature of a five-page news-release on the D35—it even tells us that the owner can have his personal monogram added to "the special identification plaque that adorns the Bonanza's safety-designed control wheel"—it appears curious that no mention is made of the make or type of engine; the C35 had a Continental E185-11 flat six giving 120 h.p. for recommended cruising speed, so presumably the D35 is similarly equipped.

THIS YEAR'S MODEL : The latest-type Beech D35 Bonanza, as described above. It was first demonstrated, say the manufacturers, to "more than 125 U.S. sales representatives attending the 1953 national distributors' meeting in a three-day session in Wichita. . . ."

SERVICE AVIATION

Royal Air Force and Naval Aviation News



ON THE WAY: The first of the ten Short Sealand amphibians for the Indian Navy—the machine handed over at Rochester on January 13th—landed at Nicosia, Cyprus, on January 29th and left the next day for Beirut.

The Duke Progresses

THIS week the Duke of Edinburgh is expected to start flying Harvards. He has completed his *ab initio* training on Chipmunks, flying from Birchan Newton, which is near the royal estates at Sandringham.

On Saturday last he spent an hour-and-a-half solo, practising forced landings, steep turns and stalls.

R.A.F. May Train German Pilots

PROPOSALS were announced by the Foreign Office last week whereby, under the as yet unratified European Defence Community Treaty, the R.A.F. will be responsible for the training of a West German Air Force, the projected size of which is approximately 80,000 men and 1,300 aircraft.

The Foreign Office announcement states: "Suggestions for assistance include the provision of training facilities, advice on training matters, the secondment of British officers to E.D.C. staffs, the provision of tactical demonstrations and joint unit training exercises.

"Suggestions for association include the exchange of officers for command and staff service, joint formation training under the overall command of the Supreme Commander, Europe, the interchange of air force squadrons and the co-ordination of the systems of air defence."

The practical application of the courses suggested, it is stated, would be carried out "in consultation, whenever appropriate with the Supreme Commander, Europe." The proposals "do not deal with matters of planning, intelligence or operational command."

In these fields "the European Defence Forces will function within the already existing NATO framework, and will automatically be associated with the United Kingdom forces already allocated to NATO."

If the proposed arrangement comes into being, it is expected that the German air crews will attend R.A.F. training schools, and that the resulting squadrons will train in the R.A.F. operational Commands.

The Foreign Office points out that the suggested arrangement is at the moment only a proposal. Neither the Air Ministry nor the Ministry of Defence has any comments to add to the Foreign Office announcement.

In the House of Commons on Wednesday last, Capt. G. R. Chetwynd was due to ask the Foreign Secretary "Why facilities are being given for the training of German officers and non-commissioned officers as instructors in Britain, and to what extent these arrangements include provisions for the training of airmen?"

Operation Floodlight

IN more than 70 sorties, flown in six days, the photographic reconnaissance organization of Bomber Command last week made a complete survey of the flooded areas of Britain. Over 100,000 photographic prints were made from the 16,500 separate negatives obtained. Operation Floodlight, as the task was called, was carried out with wartime operational urgency and proved to be of great training value.

The survey started on the morning of Monday February 2nd, and the first priority task was get large-scale photographs of the Thames Estuary and the coastline from Hunstanton to Cromer. Next on the list was a small-scale coverage of the whole of the flooded areas and large-scale photographs of the complete coastline from the Humber to Margate. Apart from the great help which these photographs provided in the work of rebuilding the sea walls, they brought to light at least one breach in the sea defences unknown to the ground authorities.

In addition to the actual photographic reconnaissance, air crews made reports from visual observations, and photographic interpreters of the three Services provided a daily summary of the main features shown in the photographs as they were obtained.

There is also in preparation a map showing the full extent of the floods and the location of each breach in the sea defences. From the photographs forming the basis of this map an assessment will also be made showing the number of buildings destroyed or damaged.

Bomber V.C.s' Gathering

MEMBERS of Bomber Command who have won the Victoria Cross were invited to dine in London on the evening (February 11th) of the première of *Appointment in London*, an exceptionally fine film which dramatizes the wartime story of a bomber squadron. The Chief of the Air Staff, Air Chief Marshal Sir William F. Dickson, was to be present.

Of the 19 members of Bomber Command awarded the Victoria Cross, only seven were still living; five of these—W/C. H. I. Edwards, S/L. L. H. Trent, F/L. W. Reid, F/L. R. A. B. Learoyd, and Sgt. N. C. Jackson—were to attend the function. From Bombay S/L. J. C. Cruikshank cabled regrets for his absence, and G/C. L. Cheshire is in hospital.

Lord Trenchard

TUESDAY of last week marked the occasion of the 80th birthday of Marshal of the R.A.F. Lord Trenchard. The following telegram was sent to him by the Secretary of State for Air, Lord De L'Isle and Dudley, V.C.: "I send you on behalf of the Air Council and all ranks of the Royal Air Force warm congratulations on the occasion of your 80th birthday.

"We recall with gratitude the courage, determination, and foresight which has done so much to create and inspire the Force. We are immensely proud of the

LARGE AND SMALL: (Left) Briefing aircrews for the large-scale, 1/5,000, coverage of the flooded areas in Norfolk and the Thames Estuary. (Right) Loading an F.49 camera, with short focus lens, into a P.R., Avro Lancaster for small-scale survey of the whole area covered by the floods.

SERVICE AVIATION . . .

unique position which you hold in the Service, and of the close personal interest which you take in its activities.

"We send you our heartfelt wishes for your continued good health and happiness."

R.A.A.F. News

THE Australian Minister for Air, Mr. W. McMahon, has announced that 13 students drawn from the Royal Pakistan Air Force and the Royal New Zealand Air Force are to be trained at the R.A.A.F. College, Point Cook, Victoria.

W/C. J. W. Hubble, A.F.C., has been appointed to command No. 77 Squadron, R.A.A.F., in Korea in succession to W/C. J. Kinninmont, D.F.C., who is returning to Australia. S/L. I. S. Parker, who has completed a tour of duty with No. 77 Squadron, has been awarded an immediate D.F.C. for his service in Korea.

New Airborne Lifeboat

FINAL acceptance trials of a new airborne lifeboat for air/sea rescue work are almost complete.

The lifeboat, which is built by Saunders-Roe, Ltd., is designed to fit under the bomb bay of the Avro Shackleton. It is 30ft long and has accommodation for 10 people, for whom there is a 14-day supply of food and a fishing kit.

The engine is specially designed for easy starting in any weather, and enough fuel is carried for a range of 1,250 miles. In addition sails are provided for use in case of engine failure. To assist navigation, radio and radar aids are installed and the whole boat is designed and fitted out in such a manner that ditched crews would be dependent to only a small degree on the air/sea rescue organization and could fend for themselves, heading for friendly territory or busy shipping lanes. A small automatic radar homing beacon can be switched on to signal the lifeboat's position to searching aircraft.

Fitting the boat to a Shackleton takes only 30 minutes, and the Dunlopillo gunwale fits snugly to the fuselage. The boat is intended to be dropped from 700ft, a deploying parachute opening the four main 42ft canopies. As the main parachutes open, carbon dioxide bottles automatically inflate the self-righting chambers at both ends of the boat.

As soon as the lifeboat is afloat, immersion switches release the parachutes, which blow away; they also release a drogue, which prevents the craft from drifting. At the same time rocket flares are fired outwards, carrying floating lines on both sides of the boat for the ditched aircrew to pick up.

The lifeboat is boarded by small doors in the side, which open from the outside; the deck is flat and self-draining, and the hull is divided into watertight compartments.

Once on board, the crew can find protective suits, inflatable cushions, sleeping bags, and first-aid kit. Awnings and a screen are provided as a protection against sun and spray.

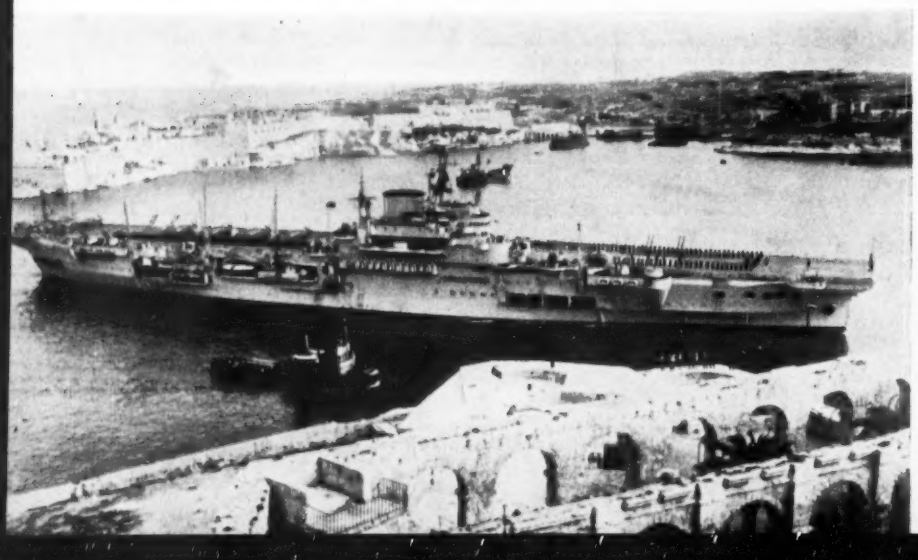
AUSTRALIAN SABRES: G/C. D. W. Kingwell, D.S.O., the Australian Air Attaché to the U.S.A., inspecting the F-86 at the Los Angeles factory of North American Aviation Corp. With him are W/C. W. C. Blakeley, Mr. R. Baker of North American Aviation and Mr. R. Ryan of the Commonwealth Aircraft Corporation, Melbourne, which is producing Sabres for the Royal Australian Air Force.

R.A.F. Foundation Studentships

FOUR studentships—three for boys and one for a girl—become vacant in September at Christ's Hospital under the terms of the R.A.F. Foundationers Trust, which was set up in 1952 with £10,000 donated by Mr. B. N. Wallis, C.B.E., F.R.S. (he had received it in recognition of his invention of the weapon used by No. 617 Squadron in 1943 for the breaching of the Möhne and Eder Dams) and a further £10,000 donated by the R.A.F. Benevolent Fund.

The studentships are open to children whose fathers served or are serving in the R.A.F., R.Aux.A.F. or R.A.F. reserves and who, on September 1st, 1943 will be between the ages of 10 years 9 months and 11 years 9 months. Full details can be obtained from the Secretary, R.A.F. Benevolent Fund, 67 Portland Place, London, W.1, to whom applications should be made before February 28th, giving service details and record of the candidate's father.

IN THE GRAND HARBOUR: The Fleet Carrier H.M.S. "Indomitable" entering Valetta harbour, Malta, during the Spring Cruise. On Tuesday of last week an explosion occurred on the hangar deck, causing the deaths of three men and injuries to a further 37. It is thought that petrol vapour was the cause; there is, apparently, no suspicion of sabotage.



R.N.Z.A.F. Visitors

LAST week A. Cdre. S. Wallingford, A.O.C., Task Force R.N.Z.A.F., returned home to New Zealand after a flying visit to Cyprus to see No. 14 Squadron R.N.Z.A.F., which is stationed at Nicosia.

While in the Middle East, A. Cdre. Wallingford flew to the Canal Zone for discussions with Air Chief Marshal Sir Arthur P. M. Sanders, A.O.C.-in-C. M.E.A.F., and A.V-M. H. V. Satterley, A.O.C. No. 205 Group, under which the New Zealand squadron operates. The journeys to and from New Zealand were made in a R.N.Z.A.F. Hastings.

Squadron Tie

AN addition to the list of unit ties at present available, published in the issue of January 9th, is that of No. 245 Squadron. These ties are available in two background colours, dark blue and maroon, from the squadron adjutant, price 21s. The unit should be addressed c/o Information Division, Air Ministry, Whitehall, S.W.1.

Reunions

THE third annual reunion dinner to be held by No. 194 Squadron, R.A.F., will take place in London on March 7th. Particulars from Mr. D. O. Williams, 63, Burnt Ash Hill, Lee, London, S.E.12.

H.Q. 44 Group, Gloucester and Stations, propose holding their fifth reunion dinner (stag party) for officers on Friday, March 6th. Particulars from C. A. Riceman, Jasmondene, River Ash Estate, Shepperton, Middx.

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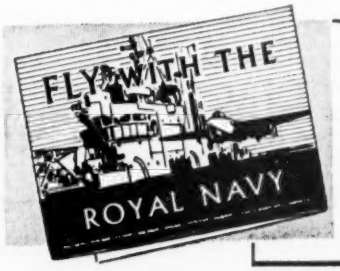

To Admiralty, C.W. Branch (DM/71), Queen Anne's Mansions, London, S.W.1.
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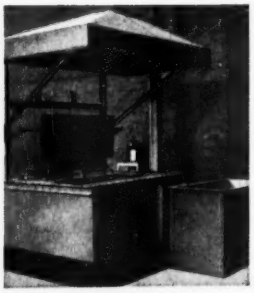

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CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Still a Dilemma

I READ with interest in your issue of December 26th the articles on technical training facilities. These, following closely on the spate of articles and correspondence headed "The Technician's Dilemma," were possibly intended to dispel gloom and despondency by hinting that, whatever is wrong today, all will be well tomorrow!

I would, however, venture the opinion that these schemes in themselves do not offer a complete solution to the problem; this will come only when conditions of technical work are fundamentally improved.

The problem can be seen in the clearest light by comparing the lot of the industrial technician with that of the technical teacher or lecturer. The academic career offers ample time for refresher courses and further studies in the long vacations, as well as for effective relaxation; but the industrial career, which requires constant application and accuracy for fifty weeks of the year, allows no real opportunity for keeping abreast of new developments. This continuous pressure of exacting work shows its effect in the prevalence of nervous ailments and disorders among technicians.

Substantial periods of leave, comparable with college vacations, would give opportunities for courses of study of sufficient length to avoid "cramming"; adequate time could still remain for proper relaxation and full assimilation of the knowledge gained during such a course. Instructors for these courses could be drawn from industrial and ministry technicians as well as the college lecturers, thereby facilitating the interchange of advanced methods and up-to-date ideas.

Some considerable re-arrangement of the industry's working programmes would, of course, be necessary to accommodate this plan, but it need not impair working efficiency or output. At present, programmes of work are subject to arbitrary delays owing to the loss of key personnel and difficulties in recruiting suitable replacements. By providing an attractive career, the firms would be assured of larger and more stable technical staffs, and suitably planned programmes could be carried out more efficiently. The major part of the work in hand in a particular department would need to be completed in time for the main leave period, during which a skeleton staff would carry on for purposes of liaison with the other departments.

It is obvious that industrial managements and Ministry departments would have to meet the technicians more than halfway if such a plan were to be put into operation, but I feel sure that in the long run the firms and ministries would reap much benefit from the increased calibre and improved efficiency of their technical staffs.

Southampton. STRESS WALLAH.

"Guidance for Bombs"

YOUR example under this heading (leading article, December 19th, 1952) drops a bomb from an aircraft travelling at 100 kt in excess of the terminal velocity of the bomb. The bomb must fall through differences of density, wind strength and direction, and temperature, but surely the fact that it is dropped into the airstream at a velocity 20 per cent greater than the terminal velocity must make further changes in trajectory? The bomb must slow up or, if not, become unstable. This would greatly increase the difficulties of bombing accurately, so adding strength to your argument in favour of guided bombs.

Cambridge. PEDANTICA.

Memories of Maurice Prévost

IN the obituary notice about Maurice Prévost, in your issue of December 5th, it is stated that he learned to fly on a Deperdussin at Rheims in 1910.

I met him first at the Doncaster meeting, October 15th-26th, 1909, which he attended as a pupil of Leon Delagrange. He was then learning to fly an Anzani-engined Bleriot XI similar to the cross-Channel type.

Delagrange had five machines there flown by himself, Hubert Le Blon, Molon, Prévost, and one other, whose name I forget.

Cody's huge shed was christened "The Cathedral" by the French pilots, and that is one of the reasons his machine was afterwards so-called. Delagrange flew to Cody's aid on the second day, when Cody started straight out of his shed but ran into a ditch filled in with sand when he landed. This was the first instance of first-aid arriving by air.

Prévost put up a very good show in the first aerial "Circuit of Europe," being one of the last ten (out of 43) competitors to arrive at Roubaix, where he had to give up, leaving only nine to complete the course: Calais - Dover - Shoreham - Hendon and back to Paris.

On April 13th, 1912, he, as chief test pilot to the Deperdussin Company, made the first air delivery of an aircraft to the British Navy by flying, with a passenger, from Issy-les-Molineux to Eastchurch, where Lieut. A. M. Longmore, R.N. (now Air Chief Marshal Sir Arthur Longmore, G.C.B., D.S.O.) immediately flew it, having had no previous experience of flying a Deperdussin monoplane.

I next met Prévost at the Military trials at Larkhill in 1912, where he was second to Cody: incidentally, Cody's machine was the fastest machine there, but as he flew his speed tests both ways in a cross-wind he is only credited with a speed of 72.4 m.p.h. Actually, his machine would fly at well over 80 miles an hour in level flight.

Prévost next turned up at St. Omer in France during the 1914-1918 war, as an adjudant test pilot of the French Air Force to demonstrate the correct method of landing the Nieuport Scout, as most of our pilots landed too heavily on the tail-skid and broke the monocoque fuselage.

This was the last time I met him, but I shall always remember his modest and unassuming manner, and his kindliness at all times.

One of the world's greatest pilots, he was a true gentleman of France, and we are all the poorer by his passing.

Many of his fellow aviators at Doncaster were killed later whilst flying, but the manner of their deaths taught valuable lessons from which their successors profited; Prévost lived on, to test, prove, and teach, and his lessons have been invaluable to mankind. May he rest in peace.

Virginia Water, Surrey. G. A. BROOMFIELD.

Ornithological Ceilings

SOME of our members with flying experience have recorded the altitude of birds seen from aeroplanes above 500 ft, and some of these records (which we hope to publish shortly) cover a period of ten years. However, in order to draw certain conclusions we should be most grateful if any readers with similar experiences would kindly let us have the details, so far as is known, of altitudes of birds seen flying, soaring or circling, particularly over the north-west of England and Wales, and the Irish Sea. The following details should, if possible, be included: species of bird, numbers seen, date, altitude, direction of flight of bird, direction and force of wind, height of cloud, height of contour of ground below, nearest location (town, etc.), visibility, mist, etc.

Records from outside this area would also be welcome, in particular over the Pennines, and anything observed at night, or dusk or dawn twilight.

Liverpool, 15. ERIC HARDY.
(Hon. Sec., Merseyside Naturalists' Association)

[Mr. Hardy's address is 47, Woodsorrel Road, Liverpool 15.—Ed].

FORTHCOMING EVENTS

Feb.	14.	British Interplanetary Society (Birmingham): "Rocket Test-bed Instrumentation," by J. Venn, B.Sc.
Feb.	17.	Birmingham and District Aviation Club: Film Show.
Feb.	17.	R.Ae.S. Section Lecture: "Recent Developments in Gliding," by A. H. Yates, B.Sc.(Hons.), A.F.R.Ae.S.
Feb.	18.	Aircraft Recognition Society: Meeting: Guest Speaker, Peter G. Masefield, M.A.(Eng.), F.R.Ae.S.
Feb.	19.	S.L.A.E. (Bristol Branch): "The Bristol Proteus," by D. Dekkers.
Feb.	20.	Institute of Navigation: "Navigation and the Operation of Jet Aircraft," by Capt. R. C. Alabaster, D.S.O., D.F.C.
Feb.	21.	British Interplanetary Society (Manchester): "Structural Problems of the Lunar Base," by P. L. Sowerby.
Feb.	24.	S.L.A.E. (Bournemouth and Christchurch Branch): "Flying Instruments and Equipment," by A. York-Bramble, A.R.Ae.S., M.A. (Oxon.), F.R.Met.S.
Feb.	24.	R.Ae.S. Graduates' and Students' Section: "Viscount Operations," by Capt. R. Rymer.
Feb.	25.	R.Ae.C.: Britannia Trophy Dinner.
Feb.	26.	Aerodrome Owners' Association: A.G.M. and Annual Dinner.
Feb.	26.	R.Ae.S.: "New Materials and Methods for Aircraft Structure," by H. J. Pollard, Wh. Ex., F.R.Ae.S.
Feb.	27.	A.T.A. Association: Annual Reunion Dinner.
Feb.	28.	S.L.A.E.: "Aircraft Fire-protection Equipment," by R. W. J. Cockram, A.M.I.E.E., A.I.Mech.E.
Mar.	6.	Helicopter Association: Discussion on Flight-testing Experiences: contribution by C. T. D. Hosegood, S/L. W. R. Gellatly and Capt. J. A. Cameron.
Mar.	7.	British Gliding Association: International Contest Victory Ball.
Mar.	7.	British Interplanetary Society: "Fabrication of the Orbital Space-vehicle," by K. W. Gatland, A. M. Kunesch and A. E. Dixon.

THE INDUSTRY

Timed Vibrations

TWO new instruments for, respectively, locating and measuring vibrations have recently been announced by Davis, Wynn and Andrews, Ltd., of Vittoria House, Cheltenham. One of them, the D.W.A. hand-held vibrograph, is shown in the accompanying photograph, which well illustrates its compact size. The instrument contains two spools, one of which is driven by a small electric motor and draws a strip of red waxed paper from the other. The probe is connected to a stylus which marks a trace on this paper by removing some of the wax coating. This leaves a thin red line which is an accurate eight-times magnification of the movement of the probe as the latter is lightly hand-held against the vibrating body.

A time-scale is clearly required in order to make the recording of such an instrument complete, and this is supplied by a second stylus which marks a trace along the base of the paper. This trace is a straight line interrupted by a blip at one- (or two-) second intervals; the stylus is operated by a solenoid, which normally receives regularly spaced electrical impulses from the D.W.A. time-base unit—the second new instrument. The vibrograph contains 20ft of waxed paper per spool, which is sufficient for approximately 20 recordings at the paper speed of rather over 3ft/sec. At the end of each recording, identification markings can be made on the paper through the window aperture, using any sharp-pointed object such as a pencil. The instrument is set in motion by a conveniently-placed thumb knob. An advantage claimed in comparison with photographic recorders is that results are immediately available. Vibration amplitude and frequency can be calculated readily from the trace.

The time-base unit is of similar size to the Vibrograph. It operates from a 12-volt supply, and emits pulses of the same voltage.

B.T.H. Appointment

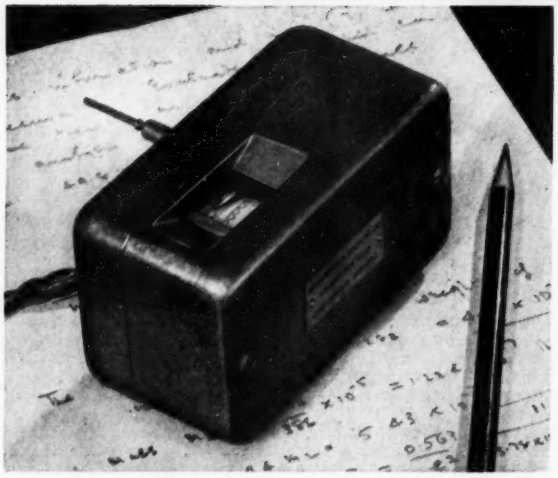
FROM the British Thomson-Houston Co., Ltd., comes the announcement that the manager of their aero and auto equipment sales department, Mr. Edmund Sayers, has retired after 20 years in that post and a total of 48 years in the service of the company.

Aircraft magnetos, generators and other electrical equipment first came within his province during World War I, and since he became manager of the department in 1932 he has been particularly well-known and esteemed in the industry. He was selected to represent British accessory manufacturers when a party of aircraft executives visited establishments in America and Canada in 1951; also, he has served as deputy chairman of S.B.A.C. accessories committee and as a member of the Society's council and of its sales and export committee.

Mr. E. Sayers

Mr. V. A. Higgs

Mr. Sayers is succeeded by Mr. V. A. Higgs, B.Sc. (Hons.) A.M.I.E.E., A.M.A.I.E.E., A.F.R.Ae.S., who has been assistant manager of aero and auto equipment sales since March, 1951. Mr. Higgs received his practical training as a B.T.H. apprentice in 1928-34, and his theoretical training at Northampton Engineering College, London University. For the period of World War II he served as a senior technical officer at M.A.P.



The D.W.A. hand-held vibrograph, described at left, is particularly small and neat in design. The recording strip can be seen in the window.

IN BRIEF

A REVISED instruction-manual for the Cirrus Major has been published by Blackburn and General Aircraft, Ltd., of Brough, East Yorks. It may be obtained from them on application —at a considerably reduced rate in the case of licensed ground engineers, provided the applicant's licence number is quoted.

* * *

All the aircraft models used in the film *The Net*, reviewed in our pages a fortnight ago, were made for J. Arthur Rank Productions by Shawcraft Models, of Iver, Bucks.

* * *

Mr. B. C. Fleming-Williams, director of research, A. C. Cossor, Ltd., and Mr. K. E. Harris, research manager, recently left this country by air on a two-month visit to the U.S.A. and Canada. They are contacting subsidiary companies and generally keeping in touch with current electronic developments in the New World.

* * *

In their monthly newsletter, John Laing and Son, Ltd., contractors, report that a £3m contract "for airfield construction in Bedfordshire" is now three-quarters completed. Runway construction began in January, 1952. Some three months later work began on another airfield site, in Warwickshire, and there is now a spirit of friendly rivalry between the Laing teams at the two projects.

* * *

From Howard Clayton-Wright, Ltd., Wellesbourne, Warwickshire, comes a leaflet describing their rubber "O" rings, widely used as seals for both static and moving joints. These rings are "custom-built" for particular applications, and the order-form poses three questions: "What fluids or gases must the rings be proof against? What minimum and maximum temperatures? What is the duration of these extremes?"

* * *

Inclined endless-belt conveyors provide an efficient means of loading luggage and freight into aircraft and on to coach roofs, though they are used more extensively on the Continent than in this country. The smaller of two new general-purpose industrial conveyors by the Auto-Truck Sales side of R. A. Lister and Co., Ltd., Dursley, Glos., would appear to be suitable for such duties; the 16ft type can be elevated to 12ft, and the 24ft type to 18ft. A 2½ h.p. petrol engine provides the power.

* * *

Sharples Centrifuges, Ltd., of Tower House, Woodchester, Stroud, Glos., announce the retirement of their chairman, Mr. W. J. Murray. He will retain his seat on the board and will be succeeded by the present managing director, Mr. A. H. Keable, M.I.Mech.E., M.I.Chem.E. Mr. G. P. Balfour, B.Sc., A.C.G.I., A.M.I.Chem.E., will fill the vacancy created by Mr. Keable's appointment. Mr. G. J. Keady, president of The Sharples Corporation, Philadelphia, has joined the British board.

* * *

The London agents of the Italian Breda concern state that two subsidiaries, Breda Ellettro-Meccanica & Locomotive, and Breda Siderurgica, have been registered with the Aeronautical Inspection Directorate as approved suppliers, and have aircraft-construction capacity available for firms seeking Continental assistance. Since the war Breda have designed and flown two civil transports, the BZ.308 and BP.471. The agents are the Central Engineering Co., Ltd., Colquhoun House, 27-37 Broadwick Street, London, W.1.

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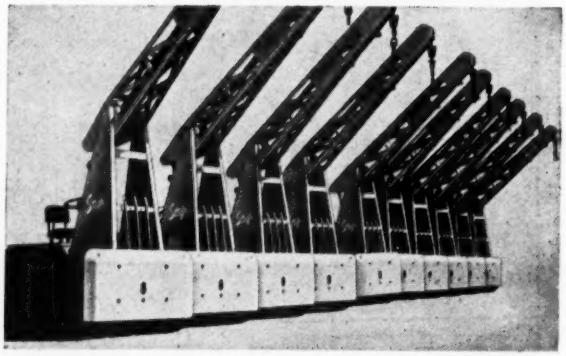

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175, PICCADILLY, LONDON, W.1.

WE are dictating this advertisement on Wednesday, February 4th, so this Year of Grace 1953 is not yet very old.

WHEN dictating, one's words flow smoothly, evenly and eloquently—that's right, smoothly, evenly and what did I say ******** Ah! Yes ******* eloquently. Much smoother, evener and eloquenter than if one were writing it down, say, on the back of a ******** of a ******* well put something down there.

LET'S see ******* where were we?

OH yes! ******* smoothly, evenly, eloquently, dictating, yes ********

TO satisfactorily dictate ******* that was a split infinitive, put it the other way round ******* Satisfactorily to dictate an advertisement *******

AS we were saying, it is Tuesday, February 3rd ******* no, Wednesday, February 4th, in this Year of Grace 1952 ******* 1953, of course, so we are not very old ******* cross that out; WE are very old but the Year is not very old. Smoothly, evenly, eloquently, dictating!

GIMME a pencil and paper and cross all that out.

IT is Wednesday, February 4th, 1953, and already this year we have received confirmed orders for or have actually shipped or delivered to clients aeroplanes of the following types:—

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W. S. SHACKLETON, LTD., 175, Piccadilly, London, W.1, have a considerable selection of aircraft actually in stock and in addition many owners have placed their machines with us for sale. C.I.F. quotation gladly.

TEL.: Regent 2448/9. Cables: Shackhud, London. [0070

R.
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DUNDAS, Ltd., 29, Bury Street, St. James's, London, S.W.1.
CABLES: "Dundassaero, Piccy, London."
CROYDON AIRPORT. CRO. 7744. [0559

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FOR sale, Auster 5 J1; Cirrus Minor engine. C. of A. to August, 1953. Offers over £400.—Further particulars from Secretary, Edinburgh Flying Club, Ltd., 50 Jeffrey Street, Edinburgh 1. [9250

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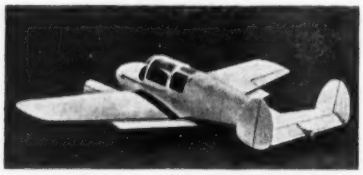

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PUBLIC ANNOUNCEMENTS

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THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM British Overseas Airways Corporation of Airways House, Brentford, Middlesex:—

Application No. 153 for a normal scheduled service with Canadair IV or comparable type aircraft for the carriage of passengers, supplementary freight and mail between London Airport and Beirut, with intermediate traffic stops at a point in Germany or Switzerland and at Rome, at an initial frequency of one service weekly, increasing according to traffic demand, during the period from April 1st, 1953, to March 31st, 1960.

Application No. 154 for a modification of the route of their existing all-freight service between London and Singapore to permit intermediate traffic stops at Frankfurt, Zurich, Rome and Beirut as alternatives to Nice, Tripoli and Cairo, for a period of six months from March 1st, 1953.

Application No. 155 for a traffic stop at Geneva, alternative to Zurich, on their normal scheduled service between London and Tokyo on the route set out as Route 2 in Schedule A, Part I, of the Terms of Reference issued to the Air Transport Advisory Council by the Minister of Civil Aviation on July 30, 1952.

Application No. 156 for a traffic stop at Dusseldorf, alternative to Frankfurt, on their normal scheduled service between London and Hong Kong on the route set out as Route 3 in the schedule described above.

Application No. 157 for traffic stops at Geneva or Zurich, as alternatives to Frankfurt, on their normal scheduled service between London and Singapore on the route set out as Route 5 in the schedule described above.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [9252

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The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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METEOROLOGICAL assistants required by the Falkland Islands Dependencies Survey for service at Port Stanley for a tour of 30 to 36 months in the first instance. Salary in scale £246 at age 18, rising to £400 at age 28 (including foreign service allowance). In certain circumstances additional responsibility allowance of £20 is payable. Free passages. Liberal leave on full salary. Candidates must be SINGLE and should have had experience of observing and the preparation of routine climatological returns.
APPLY at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London, S.W.1, quoting on letter M.28135.E. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. [9261

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GLOSTER AIRCRAFT Co., Ltd., have vacancies for aircraft design draughtsmen and electrical draughtsmen.—Write, giving full details of previous experience, age and salary required, to Employment Officer, G.A.C., Ltd., Hucclecote, Glos. [0910

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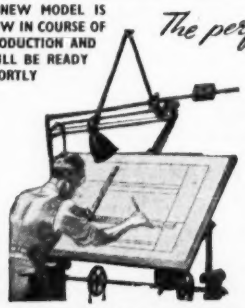

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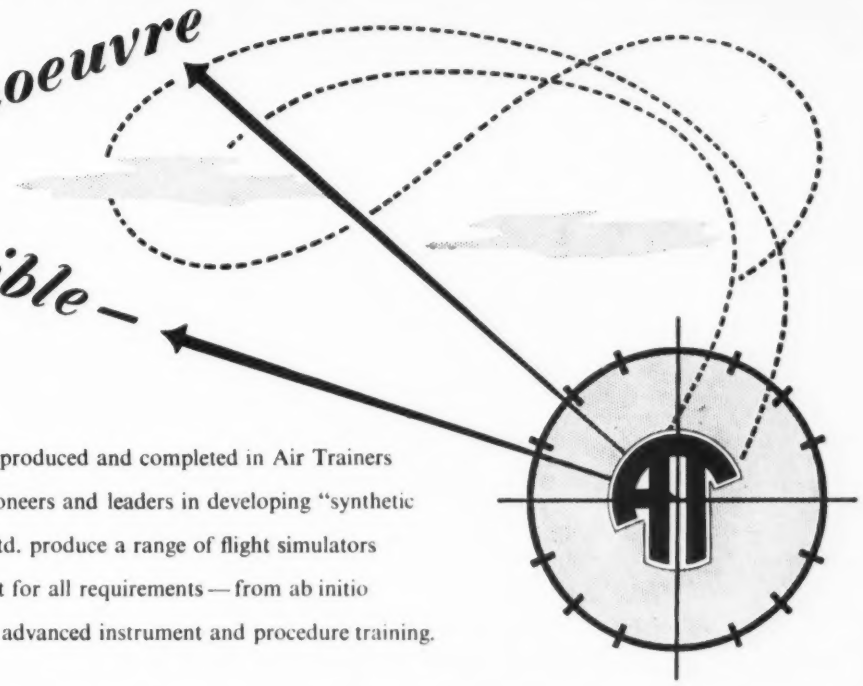

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